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SUMMARY OF RECENT ABSTRACTS*

VII. HELMINTHIASIS

[*Continued from* p. 707]

Examination of faeces

BEAVER (p. 953) has devised a method of preparing a standard direct smear of faeces, in which density to transmitted light is used as a criterion of the amount of faeces emulsified. The density is such that transmitted light of 20 foot candles is reduced to 10 foot candles. By this method fairly reliable hookworm egg counts can be made, and multiplication by 300 gives the approximate number of eggs per cc. of formed stool. Each egg on the standard smear probably represents (roughly) ten mature worms.

A minor modification of the Stoll method for counting ova has been suggested by OSORIO (p. 642), which gives slightly better results than the original method. Details are given in the abstract. BONILLA NAAR and GÓMEZ VARGAS (p. 642) describe the acid-ether-xylol (AEX) method of examination of faeces for intestinal parasites, and compare the results obtained by using it, with those of four other techniques. They found the AEX method the best for finding ova of hookworm, *Trichuris* and unfertilized *Ascaris*, and larvae of *Strongyloides*. In a paper on the diagnosis of helminthiasis, LOUGHLIN and SPITZ (p. 1152) describe a technique (CEX) for concentrating eggs in faeces. Details should be sought in the original.

NEMATODES

Hookworm infection, Strongyloides, etc.

Hookworm infection still exists in Portugal, and affects two-thirds of the population of some districts. DE AZEVEDO *et al.* (p. 1062) state that although most of the infections are mild, there are cases in which the result is severe anaemia. Hookworm infection is common in children in Queensland, Australia, and an account of the work of a special staff is given by THOMPSON (p. 852).

A case of creeping eruption due to *Ancylostoma braziliense* is decribed from French Guiana by FLOCH and CAMAIN (p. 853).

HUNG and LI (p. 273) have compared the eggs of *Trichostrongylus orientalis* with those of *Ancylostoma* in China ; the former are rather bigger and relatively

*The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1949, v. 46. References to the abstracts are given under the names of the authors quoted, and the pages on which the abstracts are printed.

longer than the latter. *Trichostrongylus* infection is fairly common, and animal experiment suggests that it is incurred by oral ingestion of the larvae.

NAPIER (p. 650) gives an account of the life history of *Strongyloides stercoralis*, which is complicated and subject to very great variation. He thinks that the worm causes lesions at the point of entry into the skin, in the lungs and bronchi, and in the intestinal mucosa, and although some infections are symptomless, they more commonly cause digestive disturbances and ill-health, subject to periodic exacerbation. Treatment is unsatisfactory. The infection was common in men who were prisoners of war in the Far East, and in them it was associated with a periodic transient urticarial eruption within 12 inches of the anus and often on the trunk or thighs ; the eruptions were sometimes petechial and sometimes linear like those of creeping eruption. They may have been due to penetration of the skin by rhabditoid larvae, or to migration of larvae, or they may have been allergic ; but in no case was a larva recovered from the lesions though larvae were always found in the faeces. The lesions were so characteristic that the author suspected that a particular strain of *Strongyloides* was concerned, but there was no morphological evidence that this was so. CAPLAN (p. 652) also records these lesions in men who had been prisoners of war in the Far East and who had bowel infections with *Strongyloides* ; he also could not demonstrate the larvae in the lesions.

Strongyloides infection is apparently prevalent in part of Brazil (DE OLIVEIRA, p. 853).

KYLE *et al.* (p. 383) describe a case of infection with *Strongyloides*.

BRANNON and FAUST (p. 955) have shown that the intradermal test and the precipitin test with an antigen prepared from filariform larvae of *Strongyloides* from a chimpanzee, are reliable diagnostic procedures in human strongyloidiasis.

BRACKETT and BLIZNICK (p. 751) have used young mice infected with *Nippostrongylus muris* for testing drugs of the trichloroacetamide group as anthelmintics. There was some action on developing worms but not on mature worms.

Nodules found in the submucosa of the caecum and ascending colon of an Indonesian male were shown by LIE KIAN JOE (p. 955) to contain *Oesophagostomum apiostomum.*

Ascaris

Ascaris infection is now quite frequent in parts of Germany ; DOLD and THEMME (p. 761) have shown that fertilized *Ascaris* eggs may be found on dirty currency notes. GÄRTNER and MÜTING (p. 1054) quote a great many figures to show that the incidence of helminthic diseases has been increasing in Germany in recent years. The increase in *Ascaris* infection is probably the result of eating vegetables and ground fruit grown on land irrigated with untreated waste water.

In Indian, African and Coloured school children in Durban, GITLIN *et al.* (p. 751) found that *Ascaris* and *Trichuris* infections were the most common. Hookworm infection and schistosomiasis were rare.

FALLIS (p. 561) produced clinical symptoms in guineapigs by giving them several thousand *Ascaris* eggs by mouth. These infections caused severe congestion of the lungs, and eosinophilia. There was evidence that the animals developed resistance to reinfection, which was manifested against the parasites before they reached the liver and lungs. VOGEL and MINNING (p. 1062) gave *Ascaris* ova to six volunteers, and noted the pulmonary signs and symptoms, eosinophilia (in varied degrees) and allergic manifestations which resulted. CATTAN *et al.* (p. 486) describe a case of fleeting infiltration of the lung in a patient with marked eosinophilia, who shortly afterwards expelled *Ascaris*.

GURTNER (p. 1063) prepared various extracts from *Ascaris suis* and tested their toxicity in animals. The protein and the total extracts were the most toxic, and both contained a histamine-like substance. PAUTRIZEL and MAYER (p. 653) show that injection of an extract of *Ascaris* into guineapigs already sensitized to it causes intense eosinophile infiltration, and that this reaction is reduced in intensity if a synthetic anti-histamine substance is administered. PAUTRIZEL and BAILENGER (p. 653) produce evidence which suggests that the haemolytic effect of an extract of *Ascaris*, which has been allowed to stand at 37°C. for 24 hours, on red cells *in vitro*, is probably due to the bacteria present in the intestine of the worm.

The radiological signs of *Ascaris* infection are described and illustrated by STRANG and WARRICK (p. 273). They are filling defects, shadows due to barium on the exterior of the worms and in their intestinal tracts, and disordered motility of the bowel.

A survey of bodies brought to autopsy in Okinawa revealed helminth infection in 60 per cent., with many multiple infections. FINK (p. 154) describes the anatomical distribution of *Ascaris* in these bodies. DA SILVA (p. 761) describes the findings in 73 children (of 1,350 brought to autopsy) who died as a result of *Ascaris* infection in Singapore. Besides acute abdominal conditions there were cases with secondary anaemia followed by enteritis and terminal pneumonia.

A fatal case of massive infection with *Ascaris*, with pockets of the worms in liver, pancreas and spleen, and masses projecting from a tear in the stomach, is described by GUHA (p. 1063). OCHSNER *et al.* (p. 955) discuss the surgical complications of ascariasis. These worms may obstruct the intestine, or other hollow organs to which they migrate (trachea, bile ducts, etc.). They may cause ulceration and perforation of the intestine, and give rise to abscess in the appendix or liver, and the latter may rupture into the thorax. Migrating larvae may cause bronchopneumonia. The authors discuss surgical treatment.

PEREIRA (p. 485) shows that although both hexyl resorcinol and tetrachlorethylene are very useful in *Ascaris* and hookworm infection, the former is to be preferred in rural areas because it is given in capsule form, and only a single dose is needed, without a saline purgative, whereas tetrachlorethylene is given in two parts, with an interval of one hour, followed by a saline one hour later. A second treatment with hexyl resorcinol may be needed on another occasion. The compound 2-ethyl-4-chloro-6-hexylresorcinol seems to be more active *in vitro* than hexylresorcinol against *Ascaris* (WILLIAMS *et al.*, p. 762).

SCHENCK and SCHULZE-BUSCHOFF (p. 384) have synthesized ascaridole and have found it satisfactory in the treatment of *Ascaris* infestation. SCHUBERT (p. 384) also writes to the same effect. BRAUN-BLANQUET (p. 954) shows that the oil of *Chenopodium ambrosioid s*, which has an ascaridole content of 60–80 per cent., is effective in various helminthic infections.

OLIVER-GONZALEZ *et al.* (p. 385) have used Hetrazan with success in *Ascaris* infestation.

Gnathostoma

DAENGSVANG (p. 1069) describes the life history of *Gnathostoma spinigerum* from the intestine of cat or dog ; the larva is ingested by *Cyclops*, in turn ingested by fresh-water fish, in turn ingested by the definitive host, including man. In Siam a fermented food made from f esh-water fish is popular, and this accounts for the fact that most reported cases are from there. The author describes 17 ; the features include pain in the skin lesions which are caused by migrating worms, and eosinophilia. Apart from spontaneous rupture of the worm through skin or mucous membrane, there is no treatment other than surgical removal.

SANDOSHAM (p. 857) has described a case of *Gnathostoma* infection in Malaya. CHEN (p. 1070) reports a case of ocular infection by *Gnathostoma*, in which the immature worm in the anterior chamber of the eye was successfully removed.

Filarial infections

WOODMAN (p. 956) discusses the various forms of filariasis found in the Sudan. *Wuchereria bancrofti* is present in the Nuba mountains, *Loa loa* in the south. The vectors of the latter are apparently *Chrysops distinctipennis* and *C. longicornis*. *Acanthocheilonema perstans* is present in half of the people of the south, and its vector is presumably *Culicoides grahami*. The incidence of onchocerciasis is high (50–88 per cent. with microfilariae in skin snips) in the endemic area, though nodules were found in only 3·1 per cent. and blindness in 0·48 per cent.

CARTER (p. 486) records the results of examination, for filarial infections, of a large number of mosquitoes in Ceylon and the Maldive Islands. Where *W. malayi* was prevalent *Mansonioides uniformis* was commonly infected, but for *W. bancrofti* the common and widespread vector was *Culex fatigans*. HOAT (p. 67) names some of the vectors of *Wuchereria malayi* in Borneo, and adds one not hitherto recognized, namely *Coquillettidia crassipes*. Larvae of *Mansonia* and *Coquillettidia* are found attached to the roots of several swamp plants, which are submerged in water.

MONTESTRUC (p. 274) gives figures of the incidence of *W. bancrofti* infection in Martinique, and discusses the relationship of this infection to tropical lymphangitis. MALDONADO *et al.* (p. 762) discuss the incidence of *W. bancrofti* infection in Porto Rico, where *Culex fatigans* is the vector. It seems that although transmission of the parasite to the vectors was occurring intensively, transmission from vector to man was more difficult. BUTTS (p. 562) examined a large number of specimens of blood in Limón, Costa Rica, for microfilariae, finding them in 10 per cent. of the samples. *Culex fatigans* is a common mosquito.

In a discussion of microfilarial counts GALLIARD and NGU (p. 67) state that peripheral blood is slightly richer in microfilariae than venous blood, and that better results are obtained with haemolysed blood in a moist chamber than with stained thick films.

HARTZ and VAN DER SAR (p. 67) describe a case of filariasis, with microfilariae in an excised enlarged lymph gland, in which there was also an eosinophilia of 23 per cent., with large numbers of eosinophile leucocytes in the gland. The microfilariae were surrounded by a homogeneous membrane which showed radiating processes.

BEACH (p. 155) describes the genital manifestations of early filariasis in American marines in New Caledonia ; the condition was characterized by recurrent attacks of lymphangitis and lymphadenitis. In comment, NAPIER criticizes the parasitological, but not the clinical, aspects of the paper.

A localized tumour, simulating scirrhus carcinoma of the breast, but due to a filarial mass, is described by HAFEZ (p. 1064).

In a discussion of filariasis and elephantiasis, BRUMPT (p. 385) argues that there is little doubt that *W. bancrofti* and *W. malayi* cause elephantiasis, but that the action of *Onchocerca volvulus* is much more open to question. OLIVIER (p. 68) discusses the mechanism of production of elephantiasis, quoting studies on analyses of oedema fluid and blood serum in relation to protein and calcium content. The fact that sympathectomy reduces the size of the enlarged limb suggests that there is a spasm effect in addition to obstruction from other causes. The discussion should be read in full.

FÉRON (p. 854) has treated elephantiasis of the limbs with injections of Rubiazol and of thiosulphates, together with the use of elastic bandages.

At a Conference, papers (published by the *Ann. New York Acad. Sci.*, p. 1161) were read by 38 authors on the chemotherapy of filariasis. The drugs considered

included arsenicals, antimonials, cyanine dye derivatives and drugs of the Hetrazan group. The report of this meeting contains an excellent summary of modern information ; this can hardly be condensed further. Most of the work has already been noticed in this *Bulletin*.

HAWKING and LAURIE (p. 1065) have studied the action of Hetrazan in *W. bancrofti* and *O. volvulus* infections. In a dose of 1 mgm. per kgm. twice daily it removes most microfilariae of *W. bancrofti* from the blood, and in somewhat larger doses it has an effect on microfilariae of *O. volvulus* in the skin (but even smaller doses always produce a violent skin reaction in onchocerciasis). The action of Hetrazan is probably to sensitize microfilariae for phagocytosis.

KENNEY and HEWITT (p. 654) report on the treatment of 296 cases of infection with *W. bancrofti* by means of Hetrazan taken by mouth in doses of 0·2 to 2·0 mgm. per kgm. three times each day for three weeks or more. Most patients treated with 0·4 mgm. per kgm. or more showed negative blood after one week. The authors show that the treatment has considerable effect on parts of the body affected by elephantiasis, and they discuss the action of the drug in general. In Tahiti GALLIARD and MILLE (p. 1064) treated with Hetrazan over 100 patients showing infection with the Pacific variety of *W. bancrofti*. Most of them were freed of microfilariae, but more than half showed relapses later. The drug gave rise to fever and malaise, nausea and vomiting, and to allergic skin reactions, but they were not serious. In comment, HAWKING points out that these are not the reactions observed in East Africa, perhaps because a different variety of filaria is involved. OLIVER-GONZALEZ *et al.* (p. 562) have re-examined patients with filariasis who were treated with Hetrazan 15 months previously ; in 13 of 23 patients no microfilariae could be found, and in the other ten the dosage of Hetrazan had been relatively low.

THETFORD *et al.* (p. 68) have treated seven patients, suffering from *W. bancrofti* infection, with an arsenical preparation Arsenamide. In three cases small numbers of microfilariae were found during the follow-up period, but in the other four the final count showed none.

KOHLER *et al.* (p. 1066) have conducted an anti-mosquito campaign with DDT in St. Croix, Virgin Islands. In a period of 19 months all houses were sprayed four times. The result was a reduction of 57 per cent. in the number of houses harbouring *C. fatigans* and *Aëdes aegypti*, and of 50 per cent. in the proportion of mosquitoes infected with *W. bancrofti*. Blood surveys revealed lower infection rates, but the difference was hardly statistically significant. On the other hand the rates in children were considerably lower, and it is realized that any change in microfilaria rate in adults must be slow, even in the absence of superinfection.

BUCKLEY (p. 854) reports a study of onchocerciasis in five foci in Kenya. By taking specimens of skin with a razor, and examining them in a drop of saline, he avoided the necessity for centrifugation. The rate of infection increases from childhood (two to three years) to old age, when it may reach 80 per cent. Eye lesions were found in up to 10 per cent. of the people, but since many blind people remain in their houses, the true incidence is probably higher ; nodules and abnormal skin conditions are found in up to 25 per cent. The vector is *Simulium neavei* which lives near fast-running rivers with well wooded banks, in hilly country. LEWIS (p. 404) has written an account of the 15 species of Simuliids known in the Sudan. The two which bite man are *S. damnosum* and *S. griseicollis* ; the former is the vector of *Onchocerca* in the Bahr el Ghazal Province. He gives details of distribution, breeding and feeding habits. WANSON (p. 387) reports that 0·53 per cent. of female *Simulium albivirgulatum* captured at Léopoldville contained "sausage forms" of *O. volvulus*, but no further development was found.

VARGAS (p. 565) summarizes the principal features of onchocerciasis in America. Evidence of infection is absent in children under one year of age, but becomes manifest in early life and reaches a maximum before maturity. For control of *Simulium* the use of DDT or BHC is recommended. NETTEL (p. 564) notes that in Chiapas, Mexico, onchocerciasis is largely confined to high altitudes, where rainfall is heavy. *Simulium ochraceum* is the common fly. VARGAS (p. 70) has studied the biology of larvae of *Simulium* in Mexico, where onchocerciasis is rife. He (p. 764) reports development of *O. volvulus* in *Simulium mangabeirai*.

ZANETTI (p. 386) refers to the cutaneous allergic manifestations found in association with *Onchocerca* and *Loa* infections. These may show oedema, pruritus, urticaria or lichenification, and are very troublesome. He has treated them by injecting auto-allergens extracted from the patient's own urine, during a period of several weeks. The effect is one of desensitization.

MARTINEZ BÁEZ (p. 856) has examined nodules removed from patients with onchocerciasis, and, although none of the patients had received Hetrazan, he found signs of degeneration in many of the adult worms, which have in other cases been regarded as the effects of Hetrazan. It is necessary to take this into consideration when assessing the effect of Hetrazan on the adult worms.

MAZZOTTI (p. 565) has treated onchocerciasis with Hetrazan, and has observed the patients for periods of 1–14 months. In all the number of embryos found was greatly diminished, but in some the embryos increased in number after four to eight months. In those patients the nodules containing adults had not been extirpated. The author notes that the action of Hetrazan on the eye symptoms is good. MAZZOTTI (p. 656) has noticed that patients with onchocerciasis tend to show allergic phenomena within a few hours of taking Hetrazan, the degree of reaction varying with the degree of infection. This reaction is not evident in infections with other worms, except *W. bancrofti*, in which similar results are produced. WANSON (p. 958) has found that Hetrazan is ineffective against adult *Onchocerca* though active against the embryos. He reports a case in which the drug was given in what was most probably the incubation period, with complete cure.

BURCH (p. 855) treated onchocerciasis with Suramin (with some success, but with troublesome reactions) and with Hetrazan. In high doses the latter produced dramatic clearance of microfilariae, though in many cases they reappeared in the skin after a few months. The patients experienced considerable side-effects, which were attributed to foreign protein from killed worms. In the author's hands Hetrazan was not very successful in *W. bancrofti* infections.

MAUZÉ (p. 1068) describes a case in which a microfilaria of *Mansonella ozzardi* was found in the sputum of a patient with haemoptysis. The patient had been out of the endemic area for four years, but this had not, apparently, had much effect on the infection.

GORDON *et al.* (p. 563) have carried out a survey of a township in the British Cameroons, in relation to *Loa* infection, which affects about one quarter of the people. *Chrysops silacea* and *C. dimidiata* are both found, though the former is much the more common. The fly bites from about 8.30 a.m. to 4.30 p.m. and is found indoors as well as in the bush. Man appears to be the chief host. Larvae are found in streams, localized in the stagnant parts and mud beneath decaying leaves. Infection rates of adult flies are recorded up to 12·4 per cent. Control of larvae may be achieved by clearing bush and canalization, or possibly by the use of insecticides. For protection, screening of day rooms, the use of dimethyl phthalate and clearing of bush round houses, are possible measures.

STEFANOPOULO and SCHNEIDER (p. 275) have been able to cure some cases of *Loa* infection with Hetrazan, but in other cases the symptoms disappeared quickly, and for several weeks or months, then returned in less severe form. This is the first drug which has given consistently good results. SHOOKHOFF and DWORK (p. 1165) treated with Hetrazan 7 patients who had Calabar swellings, though showing no microfilariae of *Loa loa* in the blood. In all but one there were exacerbations when the drug was started, but the end results were good, though two patients relapsed and one needed a second course. WANSON (p. 957) used Hetrazan in *Loa* infection in doses of 2 mgm. of base per kgm. thrice daily for 10 days, but later recommended that the courses should last 15 or 21 days, repeated 2–5 times at intervals of one month. He reports prolonged clinical improvement, but it is premature to claim radical cure. *A. perstans* did not respond to 450 mgm. daily for 15 days. LAGRANGE (p. 958) also obtained remission of symptoms with Hetrazan in *Loa* infection. BRYGOO (p. 1066) has used Hetrazan with some success against infection with *Loa loa* and *A. perstans*.

DUBOIS (p. 276) shows that *Dipetalonema streptocerca* is widely distributed in Nepoko, Belgian Congo.

In part of Portuguese Guinea FERREIRA and LOPES (p. 1068) found one quarter of the peoples affected by *Dracunculus*, with great predominance of males over females. The worms were in the lower limbs in 90 per cent. The crustacean host is *Mesocyclops leuckarti*. LINDBERG (p. 157) has studied the incidence of *Dracunculus medinensis* infection in a group of people from a village in Hyderabad, where a step well was in use, and where a quarter of the people examined were affected. Although most of the infected persons had only one or two worms, there were some with many, including one person with 200 worms. Most of the worms were in the lower limbs. PERRY (p. 277) describes a case in which *D. medinensis* was found solely in a hernial sac.

Filariasis of animals.—OTTO and MAREN (p. 1164) describe their studies on the chemotherapy of filariasis, in which they used *Dirofilaria immitis* in dogs, and *Litomosoides carinii* in cotton rats. Acridines, trivalent arsenicals and antimonials, but not pentavalent compounds, were found to have some activity. This was an investigation on a large scale, and details of the findings should be sought in the original.

KERSHAW and BERTRAM (p. 69) note the great variations which occur in the number of microfilariae in the blood of cotton rats infected with *L. carinii*, and they point out that in view of this, great care should be taken in assessing the results of chemotherapeutic trials. KERSHAW *et al.* (p. 488) have developed a method of producing controlled natural infections with *L. carinii* of groups of rats, and they have tested the prophylactic effect of the pentavalent antimonial *p*-melaminylphenyl stibonate (MSb) after intraperitoneal injection. They found that this drug was an effective prophylactic for a period of 3 weeks after administration of a dose equivalent to 250 mgm. per kilo.

KERSHAW (pp. 762, 959) has made close observations on the development and migration of the first stage larva of *L. carinii*, especially in regard to the larval sheath.

BUEDING (p. 763) reports a study of the metabolic processes of *L. carinii*, and shows that respiration and metabolism are influenced by certain substances, including cyanine dyes. These dyes were studied by PETERS *et al.* (p. 763) who found that they were active against the adult worms *in vivo*, and apparently exerted their effort through action on oxidative enzymes.

HAWKING and SEWELL (p. 387) have written an account of their method of maintaining infection with *L. carinii* in cotton rats for the purpose of chemotherapeutic studies.

In a study of the action of Hetrazan on the microfilariae of *L. carinii*, HAWKING *et al.* (p. 156) found evidence that it acts on them in such a way as to render them susceptible to attack by phagocytes of the reticulo-endothelial system. After treatment of the cotton rats the microfilariae were particularly numerous in the liver, where the phagocytic action was taking place, and in the lungs.

TRENT (p. 276) has studied the action of anthiomaline on *Dirofilaria immitis* in dogs. The effect was to cause disappearance of the microfilariae from the blood in 10–22 days of treatment, but although the effect on adult worms appeared to be to produce empty uteri in the females, there was no marked lethal action on them. Neostibosan also was found not to be effective against adult worms.

Enterobius, Trichuris, Trichinella

MARTELLI and ZAFFINO (p. 1071) found *Enterobius* infection in 74 of 220 children in Rome.

SCHÜFFNER (p. 858) makes the point that development of *Enterobius* may be slower than is generally believed, and that the time between ingestion of ova and the appearance of fresh ova in faeces may be as long as 93 days; the shortest period observed by him was 37 days. He discusses treatment, noting that only when there are definite indications that a course of drug treatment has failed should a second be given. Prevention is a matter of clean habits. Retrofection in *Enterobius* infection, by which is meant reinfection from larvae which hatch from eggs deposited in the peri-anal region, and which then re-enter the body via the anus, and migrate upwards towards the caecum, is described by SCHÜFFNER and SWELLENGREBEL (p. 960). This method of infection is unique, so far as is known. Experimental proof of the possibility of this method is established, but, although it probably takes place in natural infections, it is not known to what extent.

BOYCOTT (p. 765) suggests an improved Cellophane swab for the diagnosis of *Enterobius* infection. EBERT (p. 857) has devised a method for using a Cellophane strip for the diagnosis of *Enterobius* infection, which can be carried out by the mother of the child. BROOKE *et al.* (p. 1071) describe a cellulose-tape technique (a modification of the Graham method) for the diagnosis of *Enterobius* infection. Details should be sought in the original abstract.

KETELSLEGERS (p. 857) discusses the relation of *Enterobius* to appendicitis, concluding that it plays an important part in the pathological processes. The worms invade the mucous membrane, and enter the crypts and lymph follicles, disturbing the whole structure and causing haemorrhages.

HAND and CRISWELL (p. 765) report a case in which they claim that *Enterobius vermicularis* was the cause of otitis externa.

WIGAND (p. 1072) treats *Enterobius* infection by giving saline purges twice each week for 5 weeks or so. A watery motion must be produced, which washes out those female worms which are full of ova, and which have loosened their attachment to the bowel wall. He claims good results.

The treatment with gentian violet of *Enterobius* infection in infants is described by PICCIOLI (p. 70). The results of 3 courses lasting 5 days, with intervals of 5 days, were successful when the daily dosage was 1 cgm. for each year of age, divided into 3 doses, in keratin capsules.

DE WIT (p. 656) discusses the action of phenothiazine in *Enterobius* infection. It is a powerful and toxic drug, which should be reserved for serious cases. The solution of the problem is a matter of hygiene rather than of drugs. HÄNEL and WEISS (p. 901) have used phenothiazine successfully in *Enterobius* infection in doses up to 6 gm. spread over 5 days, for a patient weighing 60 kgm. MENDHEIM and SCHEID (p. 1166) have used phenothiazine for *Enterobius*

infections in Germany, in doses of 0·2 gm. thrice daily for 10 days for children over 10 years old. They report a cure rate of 79 per cent.

Basnuevo (p. 388) has treated a few cases of *Trichuris* infection with two pentavalent arsenical compounds, with some success.

Neghme *et al.* (p. 859) found *Trichinella* in 8 per cent. of rats trapped in Santiago, and in 5·1 per cent. of hogs reared in the same place. Neghme (p. 859) refers to outbreaks of trichinosis in Chile, and to the routine examination with trichinascope which is now required in slaughterhouses where hogs are killed.

Brooks *et al.* (p. 488) have examined the diaphragms of 50 cadavers from negroes in Mississippi ; *Trichinella* larvae were found in three.

A method for collecting living adult *Trichinella spiralis* from the intestines of rats infected 5 days earlier is described by Ross (p. 71).

Gursch (p. 388) shows that digestion of *Trichinella* cysts with pepsin for 4–8 hours does not impair their infectivity, but at 12 hours this is reduced. Refrigeration at 5°C. for 24 hours does not harm them, but at 72 hours greatly reduces infectivity.

Gursch (p. 657) shows that *T. spiralis* larvae penetrate the mucosa immediately after ingestion, especially in the upper part of the small intestine. Later the adults in the intestine cause extensive destruction of villi.

Carter (p. 766) reports a case in which viable adult *Trichinella* were found in the small intestine as long as 115 days after the onset of symptoms ; this is the longest period yet recorded. The continual release of larvae over a long period is important from the clinical, prognostic and therapeutic points of view.

Larsh and Hendricks (p. 656) discuss the difference in the localization of adult *Trichinella spiralis* in young and old mice respectively ; it is apparently a result of difference in intestinal emptying time.

Riedel (p. 657) quotes an experiment which suggests that the effect of milk in the diet of mice subsequently infected with *T. spiralis* is to reduce the number of larvae entering the general musculature.

Certain naphthaquinones administered to rats infected with *Trichinella spiralis* produced a significant reduction in the number of intestinal adult trichinellae (Oliver-González and Bueding, p. 489).

Alicata and Burr (p. 962) show that exposure of trichinous meat to radiation from radio-active cobalt sterilizes a proportion of the female *Trichinella*. *Charles Wilcocks*

MALARIA

Schroeder, W. Malariaepidemien im östlichen Norddeutschland nach dem zweiten Weltkriege. [**Outbreaks of Malaria in North-east Germany after World War II.**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1950, Apr., v. 1, No. 4, 488–511, 9 figs. [Numerous refs.]

The author presents figures which show that in 1946 and 1947 the numbers of cases of malaria infection in north-east Germany rose by leaps and bounds above the figures for the years immediately preceding. The districts of Brandenburg, Greater Berlin, Mecklenburg and Saxony and many of the 20 subdistricts are dealt with. One or two may be quoted to demonstrate the epidemic character of the post-war outbreaks. Thus, in the Guben subdistrict of Brandenburg, in 1945, there were 4 cases recorded (but this is certainly not the true incidence) ; in 1946 there were 99 cases, 60 of them autochthonous. In Niederbarnim there were 14 cases in 1945 (7 autochthonous) ; in 1946 there

were 252, of which 158 (63 per cent.) were autochthonous. In Greater Berlin in the second half of 1945 there were 145 cases ; in 1946 1,081 cases of which 470 (43 per cent.) were autochthonous. Analogous details are given of other subdistricts. Altogether in 17 subdistricts of Brandenburg there were 2,225 cases in 1946, of which 1,382 (62 per cent.) were autochthonous ; the following year the numbers fell to 873 cases, 546 (63 per cent.) autochthonous. In Mecklenburg-Vorpommern : 257 cases, 67 (26 per cent.) autochthonous in 1946, but only 76 cases in 1947, 26 autochthonous. Altogether, in 1946 there were 3,695 cases of which 1,995 (54 per cent.) were autochthonous ; in 1947, 1,411 cases, 786 autochthonous (56 per cent.). Most were *P. vivax* infections, *P. malariae* very rarely (13, of which 7 were autochthonous) and *P. falciparum* 12, all from outside. Several of the infected persons suffered from enteric fever also ; 48 with typhoid, 4 with paratyphoid B.

Aetiologically the outbreak is ascribed to the introduction of carriers—foreign workers, prisoners of war, men returning from the front and refugees. *Anopheles*, especially *A. maculipennis* and *A. claviger* were everywhere in north-east Germany ; at the same time social standards were low and sanitation in a bad way. Means of combating the outbreak included antimosquito measures in houses, cellars, etc., and prophylaxis by atebrin [mepacrine] and plasmoquine. The actual result of the last cannot be assessed because the outbreak died down in 1947 even in places where drug prophylaxis was not tried. *H. Harold Scott*

KREY, W. Zur autochthonen Malaria in Hessen. (Ergänzung bzw. Erwiderung zu Hormanns "Malaria in Deutschland 1945 bis 1947"). [**Indigenous Malaria in Hesse.**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1950, Apr., v. 1, No. 4, 511–14.

The English summary appended to the paper is as follows :—

"The article tends to prove that, other reports to the contrary, only 8 autochthonous cases out of 237 reported cases of malaria occurred in the Land of Hesse, Germany, during 1946–1947. The author sees no danger of an epidemic outbreak of malaria in Hesse." [See also HORMANN, this *Bulletin*, 1949, v. 46, 696.]

BIOCCA, E. Le ricerche del "fenomeno di gelificazione" e dei "gruppi cristallografici sanguigni d. Amantea" quali prove orientative per la identificazione del sangue ottenuto dallo stomaco delle zanzare. [**Amantea's "Gelification Phenomenon" and "Crystallographic Blood Groups" in Identification of Blood from Stomachs of Mosquitoes.**] *Nuovi Ann. d'Igiene e Microbiol.* 1950, Jan., v. 1, No. 1, 10–23, 9 figs. [22 refs.] English summary (8 lines).

The author emphasizes the importance of determining the source of blood meals of mosquitoes, but remarks that the serological technique, involving immunization of various animals, is rather elaborate and troublesome. He suggests that approximate identification of blood sources can be made by the following simple tests (suggested 25 years ago by Amantea).

(1) Nucleated bloods form a gelatinous mass when treated with certain inorganic salts. The stomach contents of a mosquito (provided the stomach is at least one-third full) are diluted with a little physiological solution and treated with 3 per cent. KOH. A gelatinous precipitate then excludes mammalian bloods.

(2) Bloods of mammals fall into four groups according to the crystallization properties of the haemoglobin. Some species form crystals of oxyhaemoglobin, others of carboxyhaemoglobin and others of reduced haemoglobin only. Yet another series have bloods which will not crystallize at all. The author lists groups of mammalian species in these categories (though he combines the first two). A simple test, then, is to allow the blood to dry in a hanging drop from a microscope slide and examine the edge for crystal formation. In air, oxyhaemoglobin crystals, and in CO_2, carboxyhaemoglobin crystals will form. These crystals exclude the blood of man, which only forms crystals of reduced haemoglobin.

Further differentiation can be made on the form of the crystals (which are illustrated by photographs). For example, the oxyhaemoglobin crystals of guineapig blood are triangular ; those of dogs, needle-shaped ; those of sheep, prismatic ; and those of donkeys, lozenge-shaped.

It is not stated how the blood of man can be distinguished from cats, monkeys and pigs [apart from precipitation tests], all of which form crystals of reduced haemoglobin. *J. R. Busvine*

Clavero, G. & Romeo Viamonte, J. M. Nota sobre la distribución del " Anopheles algeriensis " Theo. en España. [**The Distribution of** *Anopheles algeriensis* **in Spain.**] *Rev. Sanidad e Hig. Pública.* Madrid. 1948, Feb., v. 22, No. 2, 101–4, 1 map.

Dominguez, A. & Dominguez, M. Nota sobre distribución del " Anopheles Myzomyia multicolor " en Murcia. [**The Distribution of** *Anopheles* (*Myzomyia*) *multicolor* **in Murcia.**] *Rev. Sanidad e Hig. Pública.* Madrid. 1948, Nov.–Dec., v. 22, Nos. 11/12, 1042–5, 1 map.

Gaud, J., Fauré, J. & Maurice, A. Répartition et fréquence relative des espèces anophéliennes au Maroc. [**Distribution and Relative Frequency of Anopheline Species in Morocco.**] *Ann. Parasit. Humaine et Comparée.* 1950, v. 25, Nos. 1/2, 53–60, 3 figs. [19 refs.]

Eight species of *Anopheles* were collected in Morocco during 1947, 1948 and 1949. Of these species, four were very common ; these were, in order of " domesticity," *A. maculipennis sicaulti*, *A. sergenti*, *A. turkhudi* and *A. claviger*. The other species were rare : *A. multicolor*, *A. marteri*, *A. algeriensis* and *A. coustani*.

A. maculipennis is the species of the coastal plains and is most abundant in March to July. *A. sergenti* is commonest at the edge of the desert to the south, during the late summer and autumn. *A. turkhudi* is the most widespread species occurring from the coast to the mountains and from sea level to 2,500 metres, though in the plains it appears only in April–May and disappears in July. *A. claviger* is the least noticed of the four major species, with a fairly localized distribution towards the north. It is most prevalent in winter and spring. *H. S. Leeson*

Holstein, M. Un nouveau vecteur du paludisme en A. O. F. [**A New Vector of Malaria in French West Africa.**] *Anopheles rufipes* (Gough 1910). *Bull. Soc. Path. Exot.* 1950, v. 43, Nos. 3/4, 140–43.

Anopheles rufipes, already recorded as naturally infected with the plasmodium of malaria at Kano in Northern Nigeria [see this *Bulletin*, 1948, v. 45, 137] is

now shown to be naturally infected at Dori (14° 02′N., 0° 02′W.) in French West Africa. *H. S. Leeson*

Snow, W. E. **Studies on Portable Resting Stations for *Anopheles quadrimaculatus* in the Tennessee Valley.** *J. National Malaria Soc.* 1949, Dec., v. 8, No. 4, 336–43, 3 figs.

The Tennessee Valley Authority has used barns, sheds and privies as catching stations for estimating the adult densities of *Anopheles quadrimaculatus*; but since these places have been rendered useless through the application of DDT residual spray it was necessary to seek other types of catching stations.

A portable, privy type of demountable catching station was designed which had four removable panels on each side. One or more of these panels could be replaced by an entrance baffle which afforded ingress to mosquitoes through a narrow slit at the top of the baffle.

During the 1949 season the comparative effectiveness of portable, unbaited privy type traps, nail kegs and a hollow tree were tested. In general these were all favourable resting places for both male and female *A. quadrimaculatus*. All collections were made before noon and observations showed that adults of *A. quadrimaculatus* congregated on the west side of the traps and were in the resting stations by sunrise even though all the traps were empty one hour earlier. The mosquitoes left the traps from thirty minutes to about one hour before sundown even though they did not begin to feed until dusk.

Summaries are given of the catches of *A. quadrimaculatus* in the different types of resting stations, and in different modifications of the portable privy trap. The latter was shown to be the most efficient trap and the most successful combination of this was the type equipped with an entrance baffle on its west face and with the lower panel on the west side removed. This combination captured more than twenty times as many *A. quadrimaculatus* as the nail keg on the average catch per station per day. Other anophelines taken during the period were *A. crucians* and *A. punctipennis* and one female *A. walkeri* was found in one of the nail kegs. Fifteen species of culicines were also taken.

H. S. Leeson

Thompson, G. A. **Anopheline Threshold of Malaria Transmission noted in Jamaica.** *Pub. Health Rep.* Wash. 1950, May 26, v. 65, No. 21, 692–5, 2 figs.

Anopheles albimanus is the local malaria vector in the vicinity of a United States military installation in Jamaica, as it is in Porto Rico. Increase in rainfall is followed by a rise in the density of production of *A. albimanus*. Animal-bait traps were used on the perimeter of the cantonment area as an index of the *A. albimanus* population. Over a period of three months, 16 cases of malaria believed to be contracted on the site, occurred in civilians and within a 2-mile radius 11 per cent. of the local people reported "chills and fever"; during the same rainy period 4 military cases occurred. For the two weeks preceding the occurrence of the military cases the *albimanus* index in the traps had risen rapidly to exceed the critical five: it fell just as rapidly after bi-weekly aerial spraying of DDT and, although five cases were reported in civilians on the site, no further military cases occurred. From this evidence the author was satisfied that few cases of malaria would be contracted by military personnel living in screened houses and using proper malaria discipline if the vector level is held below that indicated by an average of five *A. albimanus* per trap per night. [Under similar circumstances in Porto Rico this critical figure was two.] *R. Ford Tredre*

Rachou, R. G., Lima, M. M. & Lima, A. B. Considerações sôbre o *A (N) tarsimaculatus* Goeldi, 1905 (=*A (N) aquasalis* Curry, 1942) no Estado do Ceará, com especial referência ao seu encontro a 52 quilômetros da orla marítima. [**Observations on *Anopheles tarsimaculatus* [*aquasalis*] in Ceará, with special reference to its Incidence 52 Kilometres from the Coast.**] *Rev. Brasileira Malariologia*. Rio de Janeiro. 1950, Jan. 15, v. 2, No. 1, 57–65. English summary.

The English summary appended to the paper is as follows :—

" The authors present the results of an entomologic investigation carried on in the locality of Barreira country of Redenção, State of Ceará, to determine which anopheline was responsible for the epidemic outbreak of malaria in that region in August 1949.

" Those investigations were carried on in two periods, in both of them they determined the general and specific larval index for *A (N) tarsimaculatus*; general and specific densities out and indoor for the species of *A (N) tarsimaculatus* and *A (N) albitarsis* which presented the following distribution :—

A (N) tarsimaculatus	Indoor captures	334 (70·8%)
	Outdoor captures	138 (29·2%)
A (N) albitarsis	Indoor captures	24 (11·0%)
	Outdoor captures	2,174 (98·9%)

" These data show high domesticity of *A (N) tarsimaculatus* in Barreira.

" The authors have made the same comparative study for all the regions with *tarsimaculatus* density in the State of Ceará, with routine data collected by National Malaria Service during four years, obtaining similar result, i.e., high domesticity of this species in that State.

" They consider the locality of Barreira as a new, remote breeding place of *A. tarsimaculatus* in Ceará, at a distance of 52 kilometer from the sea shore.

" They established the diagnosis of the species by its preferential habitat, i.e. breeding places, with a certain amount of NaCl, which varied from 9·5 to 27·5 grs per 1,000, by the egg's morphology, larvae, adults and male's terminalia.

" The authors consider the epidemiologic value of *tarsimaculatus* in Ceará, where, besides its marked domesticity in the State, which was again proved, in Barreira, is the only species of *Anopheles* found up to date naturally infected in Ceará, with the only exception of *A. gambiae*, which allowed the authors to incriminate it as responsible for the epidemic outbreak of malaria in Barreira."

Sicé, A. & Binder, T. Infection congénitale d'un nouveau-né due à *P. falciparum*. [**A Case of Congenital Malaria** (*P. falciparum*).] *Bull. Soc. Path. Exot.* 1950, v. 43, Nos. 3/4, 149–51.

The following is a translation of the authors' summary :—

A multipara, born in Peru and giving no history of malaria, gave birth to a female child of normal development after a lengthy labour. During the long labour, the mother developed fever without rigors. Schizonts and gametocytes of *P. falciparum* were found in her blood. During the third day of life, the infant developed fever and schizonts and gametocytes of *P. falciparum* were found in her blood also. *H. J. O'D. Burke-Gaffney*

Diaz Sanchez, M. Contribución al conocimiento del paludismo congénito. [**Observations on Congenital Malaria.**] *Rev. Sanidad e Hig. Pública*. Madrid. 1949, Mar., v. 23, No. 3, 264–70. [10 refs.]

Report of a case.

HULSHOFF, A. A. **Treatment of Vivax Malaria with Nivaquine C and Pamaquin.** *Documenta Neerlandica et Indonesica de Morbis Tropicis.* Amsterdam. 1950, Mar., v. 2, No. 1, 86–8. Discussion 88–9.

Observations were carried out in Rotterdam over a period of one year to test the value of Nivaquine C, a French resochin compound of the quinoline group closely allied to Nivaquine B (chloroquine), in combination with pamaquin, for the prevention of relapse in chronic *P. vivax* malaria. The subjects treated had acquired their infection in Indonesia, and since there is no autochthonous malaria in Rotterdam, there was no possibility of reinfection during the period of the experiment.

The subjects were divided into 3 groups. Those in the largest group received Nivaquine C 100 mgm. thrice daily for 5 to 7 days, and as soon as the temperature fell to normal they were given pamaquin naphthoate 18 mgm. thrice daily for 5 to 6 days. A smaller group received proguanil 100 mgm. thrice daily for 10 days combined with pamaquin naphthoate 18 mgm. thrice daily for 8 days. A control group received Nivaquine C only. The relapse rates in the 3 groups were :—

Nivaquine C only ...	Patients	32 ...	...	Relapses	17	(53 per cent.)
Nivaquine C-pamaquin ...	,,	138 ...	...	,,	41	(30 ,, ,,)
Proguanil-pamaquin ...	,,	26 ...	...	,,	7	(27 ,, ,,)

All the patients treated had histories of numerous previous relapses and, as the author suggested, a more accurate evaluation of the anti-relapse properties of the systems tested could be obtained by treating primary infections in an area where reinfection was impossible, e.g., in mosquito-induced *P. vivax* infections of paretics.

In the discussion which followed, allusion was made to comparative experiments carried out on jail prisoners in the U.S.A., in which quinine-pamaquin had proved the most effective of all the systems tested for reducing the relapse rate. Dr. Hulshoff agreed that this was probably the best combination of drugs at present available for that particular purpose. *G. Covell*

WATSON, R. B., PAUL, J. H. & LIANG, K. C. **A Report on One Year's Field Trial of Chlorguanide (Paludrine) as a Suppressive and as a Therapeutic Agent in Southern Taiwan (Formosa).** *J. National Malaria Soc.* 1950, Mar., v. 9, No. 1, 25–43, 4 figs. [10 refs.]

The observations recorded were carried out over a period of 55 weeks in a Southern Formosan village with a population of 417. All persons found to have parasitaemia as the result of a preliminary survey were given a therapeutic course of proguanil lasting 3 days. The entire population was then placed on suppressive doses of the drug for the first 18 weeks of the study and again from the 31st week onwards, no drug being given in the intervening period. Persons weighing 40 kgm. or over (in effect those over 15 years of age) received 100 mgm. proguanil once weekly. Children below this weight were given smaller doses according to weight, but the initial schedule proved inadequate and the dose was later increased to 2 mgm. per kgm. body weight. In the last schedule employed, infants were given a further increase of dose up to nearly 4 mgm./kgm. The therapeutic course averaged 2 to 6 mgm./kgm. daily for 3 days. In the regime finally adopted, the maximum daily dose was 50 mgm. for children under 6 years of age, 200 mgm. daily for those between 6 and 15 years old, and 300 mgm. daily for all of 16 and above.

It was concluded that the suppressive doses employed were too small for satisfactory suppression of malaria under Formosan conditions. Doubts are

expressed as to whether suppressive therapy with proguanil should be considered as a primary malaria control measure for routine use in that country, although it might be practised with advantage under epidemic conditions.

For treatment of the malarial attack, proguanil is considered to be the drug of choice, being efficient, relatively cheap and free from toxic manifestations and staining of the skin. The best response was noted in *Plasmodium vivax* infections. Five cases of *P. malariae* infection and two of *P. falciparum* proved remarkably refractory to treatment, and it is suggested that these may represent an acquired tolerance of the parasites to proguanil as the result of the suppressive régime employed. *G. Covell*

DIXON, D. S. **Paludrine (Proguanil) as a Malarial Prophylactic amongst African Labour in Kenya.** *East African Med. J.* 1950, Mar., v. 27, No. 3, 127–30, 1 chart.

The observations recorded in this paper relate to a labour force of 10,000 Africans (including 2,000 women and children) employed on the Kericho tea estates, situated 50 miles from Lake Victoria (East Africa) at an altitude of 6,500 feet. Thirteen per cent. of the force live in a reserve adjoining the estates and come to work daily. These are classed as "non-immunes." The remainder are drawn from tribes living in reserves located at various points between Kericho and the Lake, and are described as "supposedly immunes". They retain their dwellings in the reserves and come and go throughout the year, their families spending part of their time on the estates and part in the reserves.

In 1948 the entire population of the estates was placed on a régime of one tablet (100 mgm) of proguanil twice weekly from April to July inclusive, the period of the malaria season. There was a marked drop in malaria incidence, to approximately one-tenth of the average for the previous six years. In 1949 the same dosage of proguanil was repeated in all the estates from April to July, and in some estates during the period January to March also. In addition, the huts were sprayed with DDT in March and June. The malaria figures were again low, but showed no marked improvement on those of 1948, when prophylactic proguanil was the only antimalaria measure in force. It was concluded that the reduction in malaria incidence in both years was attributable mainly if not entirely to the administration of the drug.

The administration of the drug on two days each week to so large a population was apparently effected without difficulty. This régime is preferred to a single weekly dosage of 300 mgm., both for reasons of economy and because a single omission to take the prescribed dose is considered to involve less risk of a failure in suppression. The cost of administration of proguanil for the four months of the malaria season was approximately one shilling and ten cents per head. *G. Covell*

VAN GOOR, W. T. & LODENS, J. G. **Clinical Malaria Prophylaxis with Proguanil.** *Documenta Neerlandica et Indonesica de Morbis Tropicis.* Amsterdam. 1950, Mar., v. 2, No. 1, 62–81, 1 map & 10 graphs. [26 refs.]

The authors record the results of proguanil prophylaxis among approximately 10,000 persons in a highly endemic region in Java over a period of one year. The subjects fall into 3 categories : (i) 400 persons kept under strict supervision throughout the trials : (ii) communities under disciplinary control, including 4,300 school children and the labour forces of 2 plantations : (iii) the population of a village with 3,800 inhabitants.

Among those under strict supervision it was found that a weekly dose of 100 mgm. proguanil was sufficient to suppress clinical symptoms during the dry season, when the chance of infection in that area is normally small. After the onset of the rains, this dosage was found inadequate and was increased to 100 mgm. twice weekly. This proved effective except during the period April to June, when a certain number of *P. falciparum* attacks occurred among the subjects so treated.

The school children under proguanil prophylaxis were in 4 groups. Group A received 100 mgm. once weekly, group B 100 mgm. twice weekly, group C 200 mgm. once weekly and group D 200 mgm. once a fortnight. The results showed no marked difference in any of the groups, but 100 mgm. twice weekly gave somewhat better results than 200 mgm. once a fortnight. The spleen rate, originally 85 per cent., had decreased after 5 months prophylaxis to half the original figure, and the average enlarged spleen to one-quarter of its former size. There was a marked improvement in general health and fewer absences on account of sickness. The parasite rate remained at a very low figure throughout the 9 months of the experiment. Stoppage of prophylaxis was followed by a rapid increase in parasitaemia.

Excellent results were also achieved in 2 plantations from a prophylactic regime of 100 mgm. proguanil once weekly. The cost of prophylaxis was amply repaid by the increase in output, so that when free distribution of the drug ceased, the management of both plantations continued the regime at their own expense.

The village population selected for proguanil prophylaxis had been reduced by one-half as the result of terrorism, starvation and disease. A preliminary single dose of 300 mgm. proguanil was administered to the entire population ; thereafter 200 mgm. once a fortnight was given in two sectors, 300 mgm. once a fortnight in one sector and 100 mgm. once a week in a fourth. Some months later an additional régime of 100 mgm. twice weekly was introduced. Children under 6 years of age received an initial dose of 200 mgm. and thereafter half the adult dose.

For the first 6 months of the experiment the parasite index remained low, but after this a gradual increase was noted, chiefly of *P. falciparum* infections. However, a tour of inspection in which every house was visited disclosed only 3 persons suffering from fever, *i.e.*, there was parasitaemia without clinical symptoms. The mortality rate continued to drop concurrently with the rise in parasitaemia. When prophylaxis ceased there was a marked increase in mortality, accompanied by a further rise in parasitaemia confined to *P. vivax* infections. During the two years preceding proguanil prophylaxis there had been no births in the village and most of the women had ceased to menstruate. The first babies were born 9 months after the commencement of prophylaxis and early in the experiment numbers of women began to menstruate.

A comparative experiment was carried out with Nivaquine B (chloroquine) among 350 school children, the dosage being 200 mgm. weekly in one or two doses. The results were excellent, the destruction of asexual parasites being rather more rapid than with proguanil. The single weekly dose of 200 mgm. appeared to be more effective than the same amount given in divided doses. The drug proved popular and there were no toxic manifestations.

The authors stress that their object was clinical prophylaxis and not the complete elimination of malaria parasites, their intention being not to disturb the premunition of the population, but rather to maintain and promote it. They conclude that proguanil in a dosage of 100 mgm. twice weekly constitutes an ideal prophylactic agent for a population of a highly endemic region possessing some degree of acquired immunity. Stress is laid on the absence of injurious side effects of the drug and on its moderate cost. Reasons are put forward for

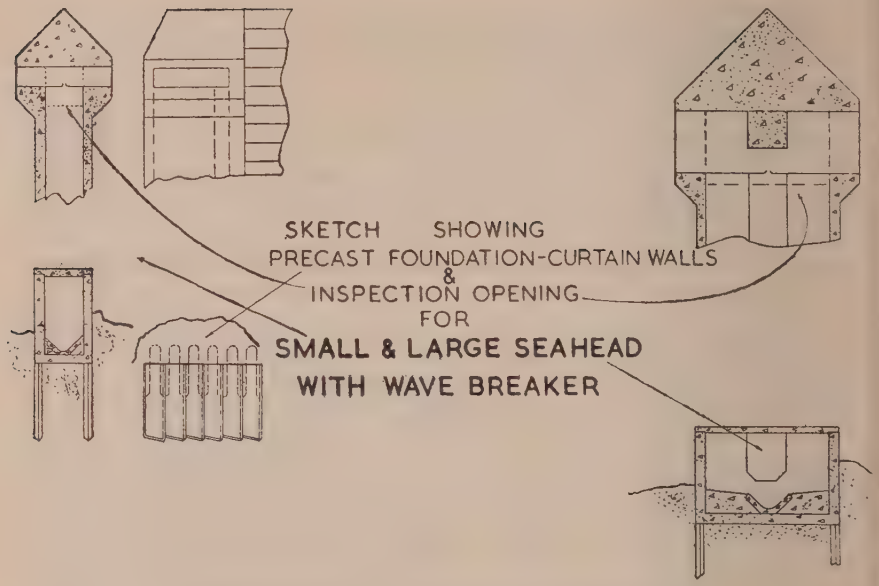
believing that the increased parasitaemia observed after 6 months of prophylaxis was not due to the production of resistance to proguanil. However, in an addendum to the paper it is recorded that the local strain of *P. malariae* had become resistant to a daily dose of 400 mgm. of the drug and that the local strain of *P. falciparum* had become resistant to a daily dose of 50 mgm. and probably also to one of 100 mgm. Resistance in the case of *P. vivax* had not been observed. The author uses the word " hyperendemic " to describe the area concerned. For a discussion of the use of this term, see WILSON, GARNHAM and SWELLENGREBEL, this *Bulletin*, 1950, v. 47, 677.] *G. Covell*

RUSSELL, P. F. **Malaria Control Activities of the World Health Organization.** *J. National Malaria Soc.* 1950, Mar., v. 9, No. 1, 1–4.

The ultimate objective of W.H.O. in respect of malaria is its world-wide eradication as a public health problem. The immediate objectives are to prove the economic feasibility of malaria control, to demonstrate its indirect benefits on health, welfare and production, and to assist and encourage governments in nation-wide control of malaria. To these ends, W.H.O. offers the services of experienced malariologists and demonstration teams to help in setting up national surveys and in training local staff ; it assists in the establishment and staffing of schools of malariology, and gives travel grants and fellowships to workers in this field ; it is actively co-operating with the United Nations International Children's Emergency Fund in attempts to reduce infant and child mortality by malaria control, and will co-operate with the Food and Agriculture Organisation in the combined agricultural and hygienic improvement of potential food-producing areas the development of which has been limited by the prevalence of malaria. The programme is already well established, five demonstration teams and two survey teams are in the field, and the World Health Assembly has given a high priority to the work. It is now feasible anywhere in the world to gain a high degree of malaria control by the use of the new insecticides ; in several countries it has been established on a nation-wide scale, but the world-wide aim can only be achieved when every Government concerned has put into effective operation an adequately financed anti-malaria organization adapted to local conditions and needs, and properly staffed. In many places such programmes are well advanced but in most there is still a great need for practical encouragement along the lines proposed by W.H.O. *G. Macdonald*

NEWBOLD, C. E. & GILLETTE, H. P. S. **Self-Clearing Sea Heads for Low Drainage through Surf and Consequent Effects on the Incidence of Malaria.** *Caribbean Med. J.* 1949, v. 11, No. 4, 137–53, 7 figs., 2 maps & 4 diagrams (1 folding).

Sandbars, due to inadequate flow in the dry season, can block the outflow of streams into the sea sufficiently to give rise to swampy conditions which may extend well beyond the immediate confines of the stream. Such is the case in parts of Trinidad where *Anopheles aquasalis* is the vector of malaria. Direct clearance of the sand bar annually is not easily done and plain circular cylindrical culverts were introduced so that continuous drainage could be maintained without interfering with the beneficial action of tidal inflow. The outlet of such a culvert also could be blocked with sand by wave action and to overcome this the authors devised a " sea head " for the end of a culvert, of an improved design. The essence of this design is to develop such water movements in the head, that sand is held in suspension and not allowed to settle, and also to promote more energy in the outflow than the inflow. A permanent land drain is constructed to collect the dry weather flow at some



[Reproduced from the *Caribbean Medical Journal*]

distance from the stream mouth and conduct it to an outfall at low tide level, at a favourable point well away from the sandbar at the mouth of the stream. The determination of this favourable point involves a survey of levels in relation to low spring tides and the angle of wave action to the beach. The land drain by-pass should be as flat as is consistent with good drainage so as to permit of a gradient of 10 in 1,000 for the terminal part through the beach to the sea head. The principles of design of the sea-head and drain are indicated in the diagram, but for full constructional detail the original paper needs to be referred to.

The second half of this paper describes briefly the history of malaria in the County of St. David on the Island of Trinidad, and the phenomenal results which have been attained by this drainage technique in lowering the incidence of malaria in this county. The source of the only malaria vector was limited to coastal swamps associated with the numerous streams which flow from hilly country into the Caribbean Sea. Annual rainfall varies between 75 and 120 inches. The fall in incidence is evident in the tabulated annual spleen rates in school children for individual villages ; in 1941 rates ranged from 38 to 72 and in 1948 at two villages had fallen to nil and at others to less than ten.

R. Ford Tredre

Logan, J. A. *Anopheles labranchiae* **Eradication in Sardinia : an Interim Report.** *Amer. J. Trop. Med.* 1950, Mar., v. 30, No. 2, 313–23, 4 charts.

The principal object of the Erlaas [*Ente Regionale per la Lotta anti anofelica in Sardegna*] experiment in Sardinia is the complete eradication of *Anopheles maculipennis labranchiae*—the only vector among the seven species of anophelines found in the island. Its breeding places cannot be accurately classified as detailed study shows that there is no type of water in which breeding may not occur, and in consequence all types must be treated in an eradication scheme.

Sardinia is the largest territory in which eradication work has been attempted. It has an area of 23,896 square kilometres, and a population of 1,200,000. It is notoriously malarious and its economic development has been hindered by this disease. Plasmodia were present in the following proportions : *P. vivax* 67 per cent., *P. falciparum* 26 per cent., and *P. malariae* 7 per cent.

The eradication scheme was started by UNRRA and passed over to the Economic Co-operation Administration, the Rockefeller Foundation assuming technical direction and providing substantial financial support. Work has been arranged according to the following timetable :—

1946	Entomological survey
1946–47	Residual spraying campaign for training purposes and to suppress malaria transmission
1947	Larviciding in test area
1947–48	" All-out " residual spraying against overwintering *labranchiae* adults
1948	" All-out " larviciding of entire island
1948–49	" Mop-up " residual spraying
1949	" Mop-up " eradication technique
1950	Final check on eradication.

DDT (5 per cent.) was used in the residual spraying campaigns, being applied at a dose of 2·0 gm. per square metre. Breeding control was organized as in the Brazilian control scheme ; the larvicide used was 2·5 per cent. DDT plus 0·5 per cent. Triton in fuel oil, applied theoretically at the rate of 0·1 pound per acre of water, but in practice usually in greater quantity. Considerable difficulties were encountered in the control of breeding. Staff had to be trained ; boundaries of sectors had to be shown by painting ; all waters were recorded and numbered ; in many places it was necessary to clear dense vegetation from the water before larvicides could be applied, and there were major difficulties in the movement of materials and men. Mop-up operations consisted of a special eradication technique within a three-kilometre radius of residual positive foci, together with subsidiary operations within a radius of two kilometres. The final check had not been undertaken at the time the paper was written, but the author believes that the final stage will tend to be prolonged rather than abrupt as in Brazil and Egypt, particularly as the relation between the " survival density " and the " recognition density " is very different from that in the case of *A. gambiae*. With this anopheline and in the conditions of Sardinia the watershed areas should be the basis of division of labour : assignment of individual responsibility in a given area for larviciding does not appear to be the best system, and the assumed superiority of adult as compared with larval scouting is not apparent.

Malaria has already disappeared ; not a single case of primary malaria was verified in 1949, and a considerable reduction in relapses is apparent, and although some sectors still contain *A. M. labranchiae* it appears to have been eliminated from the major part of the island. Whether *labranchiae* eradication is secured or not great benefit has already accrued to the island, the general health has improved, and the death rate fallen. The forgotten island which was formerly an economic liability can now be developed.

Erlaas carried out extensive fly control operations in which the difficulties due to the appearance of resistance to DDT were overcome by the use of Chlordane, which still appeared very satisfactory at the time the report was written.

G. Macdonald

i. Clavero, G. & Romeo Viamonte, J. M. El paludismo en las huertas de Murcia y Orihuela, Ensayes de aplicación de los insecticides modernos, D.D.T. y 666, en luchna antipalúdica. [**Trials of DDT and Benzene Hexachloride in Control of Malaria in Cultivated Areas in Murcia and Orihuela, Spain.**] *Rev. Sanidad e Hig. Publica.* Madrid. 1948, Mar., v. 22, No. 3, 199–228, 10 figs. (1 folding).

ii. Lozano Morales, A. Aspectos sanitarios del hexaclorocicloexano insecticida sintético de la serie 666. Acción inmediata y residual, medalidades de aplicación y técnicas apropiadas para su empleo en lucha antipalúdica. **Action and Practical Application of Benzene Hexachloride in an Anti-malarial Campaign.** *Ibid.*, 1949, Feb., v. 23, No. 2, 129–90, 14 figs. (11 on 4 pls.) [33 refs.]

i. The first paper begins with a description of a rice-growing area, 6,000 hectares in extent, in which malaria was endemic. *Anopheles maculipennis labranchiae* was the vector and this bred in the numerous irrigation canals round the rice fields. Promising results in reduction of anophelism and [rather doubtfully significant] reduction of cases of malaria, were obtained by spraying interior walls of dwelling houses with DDT and BHC. DDT was used to treat walls of 227 houses at the rate of 1 gm. per sq. metre applied from a 2 per cent. emulsion. BHC (" 666 ") was employed in 924 houses and sprayed at 0·5 gm. per sq. metre, also from a 2 per cent. emulsion. These treatments persisted in killing mosquitoes for about a month and flies for 1½ to 2 months.

ii. The insecticide BHC is valuable in dealing with both larvae and adults of malaria-carrying mosquitoes. [It appears that a mixture of isomers containing 13 to 15 per cent. *gamma* BHC was used throughout.] As a larvicide, it can be used as a dust, as surface-acting oil solution or as an emulsion. The last mentioned appears to be most effective since the author states a 1 in 1½ million emulsion will destroy eggs and pupae as well as larvae and give residual action for 45 days. This emulsion also destroys larvae of *Chironomus plumosus*, which is an annoying pest to the rice workers.

BHC can be used against adult mosquitoes by treating walls of dwelling houses at the rate of 500 mgm. per sq. metre. Three treatments in the year are recommended (1) in March–April, (2) in May–June, (3) in September–October. The last mentioned can be at a rather lighter rate, since the earlier treatments will have built up a lethal effect.

Extensive spraying in the marshy hyperendemic area at the delta of the Guadalquiver has had the effect of lowering mortality and eliminating severe cases of pernicious malaria owing to the disappearance of *Plasmodium falciparum* since August, 1947. *J. R. Busvine*

Livadas, G. **Reduction and Disappearance of Anopheline Species prevailing in Attica (Greece) as a Result of Control Program carried out during 1946–1949.** *Riv. di Malariologia.* 1950, Apr., v. 29, No. 2, 73–82, 1 map.

In the years since 1945, house spraying with DDT has been widely used in Greece against domestic anophelines, apparently with good results. Owing to the unsettled state of many country districts, it has been difficult to obtain reliable data. Therefore it was decided to estimate the general effect by surveys of the Attica district which had the advantages of having been heavily malarious and of being near to the Athens H.Q.

Parasite surveys were made in 1945–6 before spraying with DDT was introduced into this province. Scattered observations made on 500 children at 10 villages gave an overall parasite rate of about 10 per cent. [calculated from

author's data]. Similar surveys at all 17 villages in the district in the autumn of 1948 and 1949 gave all negative results except at one village in 1948 where 1 per cent. was recorded on 100 children.

Regular inspections for *Anopheles* were also made in 1949. Unfortunately there exist no comparable data for years prior to spraying with DDT, but it was known that the main vector, *A. sacharovi*, was very common. For example, in one barn 1,000–2,000 specimens had been caught in quite a short time.

Collections were made 8–10 times in 1949. Adult searches were made in 243 sprayed bedrooms and 35 sprayed barns and 22 unsprayed bedrooms and 41 unsprayed barns.

The results showed an almost complete disappearance of *A. sacharovi* and *A. maculipennis* adults from houses and a considerable reduction in *A. superpictus* adults.

Regular searches for the aquatic stages showed a very great reduction of *A. sacharovi* or *A. maculipennis* larvae and a reduction of *A. superpictus* breeding. On the contrary there seemed to be a slight expansion of *A. claviger* breeding ; this species tending to spread into streams typical of *A. superpictus*.

The general result of the work was to prove that a very great reduction of breeding of domestic anophelines can be achieved by house spraying with DDT. [See also this *Bulletin*, 1950, v. 47, 594.] *J. R. Busvine*

ZIONY, Miriam. **Malaria Control in Iran. Résumé of Reports made by Dr. Justin M. Andrews and Lawrence B. Hall.** *Pub. Health Rep.* Wash. 1950, Mar. 17, v. 65, No. 11, 351–67.

About 4½ million of the 16 million inhabitants of Iran live in malarious areas, in which the disease is carried by *Anopheles superpictus*, *A. stephensi*, *A. sacharovi* and *A. maculipennis*. Some control schemes have been operated since 1944. The Government is now preparing a seven-year plan of economic development which will include public health measures ; one of these is malaria control. Dr. Justin M. Andrews and Mr. Lawrence B. Hall report on a proposed scheme, which, it is recommended, should be in three phases. The demonstration phase is intended to arouse public interest and should be confined to highly malarious areas, in which 92,000 houses are to be treated twice a year with DDT ; kerosene solutions would be used in some and water-wettable powder in others for purposes of comparison. In the succeeding operational phase work should be expanded to cover all malarious houses, reaching 880,000 houses in 1952, and in the maintenance phase any residual foci of malaria should be searched for and attacked. It should not be changed into a permanent system of domestic insect control except by deliberate expansion and suitable financial arrangement. A malaria control unit should be formed and should consist of a medical officer, one engineer and a biologist, initially from overseas staff ; they should engage in teaching and investigation as well as routine executive work. Some minor technical recommendations are also made.

G. Macdonald

LAWLOR, W. K. **A Method of evaluating Density of Anopheline Breeding for Purposes of Malaria Control.** *J. National Malaria Soc.* 1950, Mar., v. 9, No. 1, 89–94, 1 fig.

The author refers to the need for accurate assessment of the numbers of anopheline larvae as well as the prevalence of breeding places, and for information on the relative prevalence of the different instars as a guide to effective anti-larval work. He gives details of a report form which will help towards this. *G. Macdonald*

Indian Research Fund Association. Rep. Scient. Advisory Board for Year 1948, 18–32. **Malaria.**

The Malaria Institute of India has made enquiries into the technology of DDT formulations and tested new formulae. Field trials of these DDT preparations applied at 50 mgm. DDT per square foot (1·76 oz. per 1,000 square feet), and a gammexane suspension at 1 mgm. gamma isomer per square foot (0·035 oz. per 1,000 square feet), gave mosquito control for ten or more days. Gammexane appeared to be more active than DDT against both flies and mosquitoes. Trials in Madras, where humidity is high, indicate that 1·76 oz. DDT per 1,000 square feet effectively prevents malaria transmission by *Anopheles fluviatilis*. Associated biological observations were made on this anopheline. Several spread-aiders for anti-malarial oils were tested. Triton X 100 and Triton X 155 were superior to Turkey Red oil.

Three ounces of DDT or DDT solution ? per 1,000 sq. ft. gives control of *Phlebotomus argentipes* for seven to eight months.

Therapeutic trials of anti-malarial drugs were continued at the Calcutta School of Tropical Medicine, and work is reported which has already been noted in [this *Bulletin*, 1949, v. 46, 325, 610].

Workers at the Haffkine Institute are synthesizing compounds in a search for a cheap and effective anti-malarial drug. The types being tested include one of the thiazole series with a *para* chloro-phenyl-amino group attached to the thiazole ring which carries various substituents. Work is also being carried out on 4-substituted quinolines in the hope of finding a therapeutic agent active against exo-erythrocytic forms of plasmodia. *G. Macdonald*

Bertram, D. M. **Malaria Control by Residual Insecticides.** [Correspondence.] *Brit. Med. J.* 1950, May 20, 1200.

Several years ago, DDT spraying was introduced as an anti-malarial measure for the labourers of an Assam tea estate. The result was a gratifying reduction of mosquitoes as inferred by daytime counts of those resting in the houses ; but there was unsatisfactory reduction in malaria or spleen rates. At this time Muirhead Thomson's results [this *Bulletin*, 1949, v. 46, 439], were published which showed the repellent effect towards *Anopheles gambiae* of sub-lethal doses of DDT. It was decided to investigate this possibility in regard to *Anopheles minimus* which is the vector in Assam. Houses were prepared with exit traps and sprayed with :—

(i) DDT suspension (1 per cent.) to give 45 mgm. DDT per sq. ft.
(ii) DDT suspension (5 per cent.) to give 215 mgm. DDT per sq. ft.
(iii) *Gamma* BHC suspension to give 11 mgm. *gamma* BHC per sq. ft.

The results of five experiments were as follows :—

Treatment	Daytime mosquito count	Dead mosquitoes on sheet on floor overnight	Mosquitoes in trap	
			Dead	Living
(i)	39	58 (45)	9 (7)	470
(ii)	37	733 (445)	7 (5)	215
(iii)	25	645 (420)	41 (11)	0

The figures in brackets are numbers dead after a blood meal. Of the 470 and 215 live mosquitoes in the traps of the DDT huts, 461 and 215 respectively were alive 24 hours later.

These results show that *A. minimus* reacts like *A. gambiae* to DDT and *gamma* BHC. It appears that *gamma* BHC is much more efficient for malaria control. Also it was cheaper, as the relative costs were :—

1 per cent. DDT, 4 treatments	Rupees	2,400
5 per cent. DDT, 2 treatments	,,	6,000
" Gammexane P520 ", 4 treatments ...	,,	1,770

J. R. Busvine

Andrews, J. M. & Gilbertson, W. E. **Final Phases of Malaria Eradication in the United States.** *J. National Malaria Soc.* 1950, Mar., v. 9, No. 1, 5–9, 1 fig.

Previous stages in the programme for the eradication of malaria from the United States have been noted in this *Bulletin*, 1949, v. 46. 440. It is now reaching its final stages ; the reported morbidity in malarious States has dropped to less than 7 per 100,000 population per annum, and mortality to 0·2 per 100,000. As malaria can no longer be considered to be widely distributed it is advisable to concentrate future work in the neighbourhood of reported cases in order to avoid wasteful and inefficient effort. This will necessitate a further improvement in the standards of diagnosis which has become a major part of the scheme's interest. Technicians and laboratory supervisors are trained and a reference diagnostic service is maintained to which difficult or questionable specimens may be sent for examination. Efforts are being made to verify the diagnosis of malaria, particularly when it is given as a cause of death, and this may itself result in some reduction of the figures, but the object is to facilitate intensive work around verified cases. The author considers that there will soon be no deaths ascribed to malaria and this will necessitate further reliance on clinical diagnosis which will need further improvement.

G. Macdonald

Stage, H. H. & Berti, A. L. **Observations on Mosquito and Malaria Control in the Caribbean Area. Part 5.—Venezuela.** *Mosquito News.* 1950, Mar., v. 10, No. 1, 22–5, 3 figs.

de Bustamante, F. M., Aguirre, G. H. & Filho, J. C. A. Nota preliminar sôbre a redução da malária na bacia do médio São Francisco por meio de DDT em aplicações intra-domiciliares. [**Preliminary Note on Reduction of Malaria in the Medium Valley of the São Francisco River by House-Spraying with DDT.**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1950, Jan. 15, v. 2, No. 1, 49–56, 1 graph. English summary (7 lines).

The English summary appended to the paper is as follows :—

" The authors present parasitary, splenic, and anophelinic house indices, raised in a group of localities in the Medium Valley of Rio São Francisco, on the states of Bahia and Minas Gerais, before (1947), and after two sprays with DDT inside the houses (1948). Comparison of indices of 1947 with those of 1948 shows a significant reduction in malaria's incidence, and a remarkable reduction in anopheline density inside the houses. The dosage of residual DDT per square meter ranged from 1 to 2 grammes."

Rachou, R. G. & Ferreira, M. O. Primeiras provas experimentais com termoneblinas tóxicas no combate aos anofelinos do sub-gênero Kerteszia. [**First Experiments with " Thermo-Fogs " against** *Kerteszia* **Mosquitoes.**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1950, Jan. 15, v. 2, No. 1, 23–37. English summary.

The English summary appended to the paper is as follows :—

" From March 30th, to April 5th 1949, the authors have made two experimental applications of toxic thermo-fogs against anophelines of the subgenus *Kerteszia*, in Santa Catarina.

" On field tests, they have used as insecticides a 5% DDT oil solution and hexachlorobenzene, a 3% Hexiclan oil solution. In those experiments the authors produced with a Tifa engine, manufactured by Todd Shipyards Corporation, New York, U.S.A. thermo-fogs with particles of 40 micra in diameter, and to evaluate the effects and distance ranges of the thermo-fogs spray, they put in front of the generator engine, and from ten to ten meters until a distance of 100 meters, mesh cages with larvae and adults of *Kerteszia*. They could then observe that the thermo-fogs reach distances much greater than 100 meters.

" The authors pointed out that either DDT or hexachlorobenzene, can be used as insecticides in thermo-fogs to control anophelines of the sub-genus *Kerteszia* and that within a distance range of 50 meters from the generator engine, hexachlorobenzene in thermo-fogs, had good larvicide effect.

" They stated that new tests will soon be carried out with same insecticides at different dosages (greater with DDT), not only in open fields but in forests, aiming specially a larvicide action against anophelines of the sub-genus Kerteszia."

VAN DEN BERGHE, L., VINCKE, I. & CHARDOME, M. La phase tissulaire de *Plasmodium berghei*. [**The Tissue Phase of** *P. berghei*.] *Ann. Soc. Belge de Méd. Trop.* 1950, Mar. 31, v. 30, No. 1, 79–82, 7 figs. (5 coloured) on 3 pls.

The authors report the finding of exoerythrocytic stages of *Plasmodium berghei*, the parasite recently described from the African rodent *Thamnomys surdaster* [this *Bulletin*, 1948, v. 45, 979]. The strain was passaged by blood inoculation through mice which were killed at various intervals from the time of inoculation and their tissues carefully examined in smears and sections. From the 36th hour and to the time of the animal's death, exoerythrocytic schizonts—producing up to 30 merozoites—were found in the histiocytes of the liver and bone marrow; in the latter tissue they also occurred in the endothelial cells of the capillaries. The EE schizonts are depicted in a number of coloured plates and in photomicrographs, which appear to represent tissue smears. In *P. berghei* the parasites inoculated with the blood are rapidly removed from the circulation into the tissues, where they are presumably held up by cells of the reticulo-endothelial system in which they initiate the EE development. This development precedes the invasion of the blood, in which the first erythrocytic forms make their appearance 48 hours after inoculation. Since the course of development from sporozoites is thought to be similar to that initiated by blood forms, the authors do not recognize in the tissue development any difference between the terms " pre-erythrocytic " (originating from sporozoites) and " exo-erythrocytic " (stages appearing later). [Here there seems to be a misunderstanding, for the term *exoerythrocytic* is a comprehensive name used for *all* the stages of development of the parasite, irrespective of its origin, while *pre-erythrocytic* has a restricted meaning.] They suggest that only two types of development of malaria parasites should be recognized: the reticulo-endothelial and blood phases, the former preceding the latter, after which the two become concomitant. *C. A. Hoare*

TRAGER, W. & MCGHEE, R. B. **Factors in Plasma concerned in Natural Resistance to an Avian Malaria Parasite** (*Plasmodium lophurae*). *J. Exper. Med.* 1950, Apr. 1, v. 91, No. 4, 365–79, 1 fig. [20 refs.]

It has been observed that various factors including species, age and physiological state of the host are associated with resistance to infection

with *Plasmodium lophurae*. Thus the embryos and very young chicks and ducks are very susceptible, whereas adult hens but not all adult ducks are uniformly resistant to infection. It has now been shown that at least one factor concerned with resistance is present in the plasma of the host in question, for injection of such plasma gives rise to an antimalarial effect in susceptible birds infected with *P. lophurae*. Three strains of the parasite were maintained by blood passage respectively in ducklings, chicks and chick embryos for use on appropriate occasions. To demonstrate the presence of the resistance factor in serum, young hosts were infected with *P. lophurae* and then treated with homologous serum from older birds. The chickens infected were approximately one week old and weighed 70 gm. For each 100 gm. of body weight 200 to 400 million parasites were injected and caused a patent parasitaemia immediately. The birds were treated intravenously with 3 ml. of fresh heparinized plasma immediately after infection and for three further days, or alternatively on the two days after the day of infection. Blood films were examined each day for six days. Besides untreated controls, birds receiving saline injections were also observed. A fraction containing euglobulins from hen plasma was also given in saline. Embryos which had been incubated for 14 days were infected from other embryos and given 0·2 ml. heparinized plasma intravenously and a similar amount two days later. Ducklings received treatment similar to the chicks and survivors were killed on the tenth day. The donor ducks received a challenging dose of *P. lophurae* after serving as source of serum and the infection was again followed in stained slides.

It was found that chicks treated with two or more doses of hen plasma had a peak of parasitaemia on the same day as untreated controls but this, however, was lower. Heating at 56°C. for half an hour was apparently without effect on adult plasma, but it was rendered inactive by heating for a similar period at 65°C. followed by removal of coagulated protein. The euglobulin preparation reduced the peak of parasitaemia compared with controls. Treatment of embryos had some effect on the course of infection but did not save life. In ducks there was marked correlation in the results obtained with resistant adult birds and effect exercised by their plasma on young susceptible hosts. In both chicks and ducklings treatment with adult plasma was associated with fewer merozoites per segmenter. The authors conclude that in birds showing resistance something is present in their plasma as distinct from specific antibodies giving rise to acquired immunity. Trager [this *Bulletin*, 1948, v. 45, 159] has already shown that in *P. lophurae* and *P. cathemerium* infections of ducklings the amount of a lipoprotein-like substance varies and may be the effective substance concerned with resistance although this view is not always borne out by experiment. *J. D. Fulton*

Lewert, R. M. **Alterations in the Cycle of *Plasmodium gallinaceum* following Passage through Tissue Culture. I. Tissue Culture Studies.** *Amer. J. Hyg.* 1950, Mar., v. 51, No. 2, 155–77. [56 refs.]

The investigations described in this paper were carried out with the object of determining, first, whether or not the exoerythrocytic stages of *Plasmodium gallinaceum* can be maintained in serial passages of tissue culture, and secondly, the effect of such maintenance *in vitro* upon the subsequent behaviour of the parasite *in vivo*. Sterile tissues were grown in roller-cultures, while, for periodic microscopic observations of fresh or stained material, slide cultures were made, as well as tube slips consisting of coverlips placed in the roller tube and containing a portion of the tissue grown in the main culture. After preliminary cultures of normal chick tissues indicated that cells derived from the pia mater and the myocardium grew best, they were used exclusively for tissue cultures

from infected birds. The chicks used for these experiments varied in age from 15 to 40 days at the time when the tissues were removed from culture. They were inoculated intravenously with blood heavily infected with malaria parasites, and 24 hours later and daily afterwards they were given 70 mgm. quinine hydrochloride per kilo. Chicks thus treated usually die of exoerythrocytic infection 14 days after inoculation. In the present case they were sacrificed one day earlier. The roller-tube tissue cultures of EE stages of *P. gallinaceum* were maintained by serial transfers up to four months. Those derived from pia mater were infective for chicks 105 days after the cultures were started, having gone through five subcultures. The infectivity of myocardium cultures for chicks did not extend beyond 34 days' cultivation. While the use of a homologous nutrient medium (derived from chicks) favoured the growth of the parasites, heterologous medium (beef and human sources) was detrimental to the parasite, causing the cultures to lose their infectivity after one month. As a rule the parasites were scarce in the subcultures, only a few intra- and extra-cellular schizonts being detectable. One of the characteristic features of infection in chicks inoculated with tissue cultures was the absence of any pigmented erythrocytic stages, all parasites being exoerythrocytic. While cultures could be easily initiated from infected tissues, attempts to infect normal tissues *in vitro* by inoculation of infected blood or brain suspension containing EE forms were unsuccessful. *C. A. Hoare*

LEWERT, R. M. **Alterations in the Cycle of *Plasmodium gallinaceum* following Passage through Tissue Culture. II. The Behavior of the Strains during Multiple Passage through Chicks.** *Amer. J. Hyg.* 1950, Mar., v. 51, No. 2, 178–93. [25 refs.]

In the preceding paper above, the author demonstrated that *Plasmodium gallinaceum*, when maintained in tissue culture, lost its power to develop in erythrocytes and produced in chicks an infection with exoerythrocytic forms. In the present paper he deals with the behaviour of such strains in serial passages through these birds. The EE forms were transferred from chick to chick by intraperitoneal inoculation of 0·5 ml. homogeneous emulsion of the brain from an infected bird, the total number of passages with different strains being from two to 26. When young chicks were used for passage, the infection was invariably exoerythrocytic, though at the time of death (usually about four days after inoculation) the erythrocytes of some of the birds contained small *unpigmented* parasites. However, the infection can be induced to revert to the normal erythrocytic cycle in two ways: (1) by continuous blood passages starting with birds dying of infection with the EE strain, or (2) by intraperitoneal inoculation of infected brain material in older birds, which have survived the attack of EE parasites. In such passages the number of erythrocytic parasites increased progressively, while that of EE forms decreased, until the birds died of the blood infection. The exclusive development of EE stages in tissue culture is thought to be due to the production of histotropic merozoites which kill the host before the erythrocytic forms can develop. On the other hand, in normal strains - passed by blood inoculation - the merozoites preferentially infect red blood cells and kill the bird before EE forms are produced. The types of development observed, therefore, represent a separation of the two cycles. In the course of these experiments it was found that among the early erythrocytic stages there was a high production of gametocytes, indicating that the EE stages play an important part in the production of gametocytes, which possibly arise in the erythrocytes directly from merozoites of the EE phase, *i.e.*, without the intervention of erythrocytic schizogony. From this point of view, the latter cycle is superfluous and represents a later acquisition in *Plasmodium*,

while *Hepatocystes*, *Haemoproteus* and *Leucocytozoon*, in which there is only an EE development giving rise to gametocytes in the blood, probably represent the ancestral type of Haemosporidia. *C. A. Hoare*

Mudrow, Lilly & Reichenow, E. Endotheliale und erythrocytäre Entwicklung von *Plasmodium praecox*. **Endothelial and Erythrocytic Development of *P. praecox*.** *Arch. f. Protistenk.* 1944, v. 97, No. 1, 101–70, 2 text figs. & 3 pls. (2 folding). [75 refs.]

In 1943 the authors published a preliminary account of their investigation on the exoerythrocytic cycle of development of *Plasmodium praecox* [*P. relictum*] after inoculation of sporozoites into canaries. In the present paper they give a very complete and detailed account of this work, with full documentation and a series of excellent illustrations. Since all the essential data contained in this paper have already been adequately summarized in a review of the previous article [this *Bulletin*, 1944, v. 41, 190], they need not be repeated here, but readers desiring more detailed information on this subject should consult the original. *C. A. Hoare*

Hunninen, A. V. & Young, M. D. **Blood Protozoa of Birds at Columbia, South Carolina.** *J. Parasitology*, 1950, June, v. 36, No. 3, 258–60.

"Of 737 birds caught at Columbia, S.C., 27·5 per cent showed some blood protozoa; 17·5 per cent showed *Plasmodium*. *Plasmodium relictum* accounted for 67·0 per cent of the plasmodia identified. In English sparrows, the plasmodia appeared to be less prevalent during the summer than during the remainder of the year."

TRYPANOSOMIASIS

East Africa High Commission. **East African Tsetse and Trypanosomiasis Research and Reclamation Organization. Annual Report 1949** [Lester, H.M.O.]. 26 pp., 3 figs. 1950. Nairobi.

Dr. H. M. O. Lester reviews the work of the new organization (often referred to by its initial letters EATTRRO) which embraces both work on tsetse and on trypanosomiasis. The tsetse research has been carried out by a number of workers attacking the problem from several angles. The habits and tropisms of the various species of *Glossina* have been studied in the laboratory and these are being related to ecological work in the field. Shade, temperature and soil conditions in various situations are being studied in relation to fly resting places and also to the preferred pupal sites. Topographical studies are assisted by careful interpretation of air photographs. Related investigations have been made into the East African flora and on the predatory ants and termites (which attack fly pupae) and on small game animals.

The study of methods of tsetse exclusion are being continued in two large blocks; one is excluding *G. swynnertoni* by fire exclusion; the other, all tsetse flies by game destruction. A special study of the tsetse problem due to *G. austeni* is being made in Zanzibar.

Dr. Fairbairn, of the Tinde trypanosomiasis laboratory, is about to retire and has been engaged in writing up several years' observations on the trypanosomes. *T. rhodesiense* has been maintained for 15 years in sheep and shows no sign of reverting to a non-pathogenic *T. brucei*; it does, however, produce a chronic *gambiense* type of infection in man suggesting that it is closely related to this form, but distinct from *brucei*. Certain morphological differences in trypanosomes have been observed and these have been studied in relation to their pathogenicity, at the new field station at Babati. The results suggest that a number of races of polymorphic trypanosomes exist and that mixtures of them may change their characteristics.

Some tsetse reclamation schemes in various areas are described with the progress made up to date. The number of these experimental schemes has been reduced to six (two in Tanganyika, three in Kenya and one in Uganda) in order that careful plant ecology surveys and detailed fly round observations can be made. These careful studies have shown the exact loci infested with various species of *Glossina* with considerable precision, so that the labour of clearing vegetation is greatly reduced. This is clearly illustrated by the results at Tabora in Tanganyika, where very little progress was made in the first year of the scheme. By this time the favoured habitat of the fly had been carefully defined and, thenceforward, discriminative clearing successfully brought down the numbers of *G. morsitans*.

Some preliminary experiments with *gamma* BHC smokes have been made against *G. pallidipes* and *G. swynnertoni*. Considerable success against the latter was obtained by four fortnightly applications in the naturally isolated block known as Atta island in the Kondoa district of Tanganyika. An insecticidal smoke (produced by a TIFA generator) has been used for de-flying trains on the Mombasa-Nairobi railway line. *J. R. Busvine*

Vanderplank, F. L. **Air-Speed Wing-Tip Speed Ratios of Insect Flight.** [Correspondence.] *Nature.* 1950, May 20, 806–7.

The author is interested in the aero-dynamics of flight in tsetse flies. He does not explain precisely the conditions under which his work was done, except that the insects (*Glossina palpalis*) were in free flight, and that the observations were made with a stroboscope and from the study of a large number of "flash" photographs, in each of which the exposure was exceedingly short. The wings of *G. palpalis* go through about 120 cycles per second and the time occupied in different parts of the cycle has been recorded. The halteres go through a similar number of cycles vibrating in a direction which is opposite that of the wings. The maximum speed of the insect is approximately sixteen miles per hour. The author suggests that the antennae act as indicators of air speed and air tolerance (in addition to other functions). *P. A. Buxton*

Fairbairn, H. & Culwick, A. T. **Some Climatic Factors influencing Populations of *Glossina swynnertoni*.** *Ann. Trop. Med. & Parasit.* 1950, Apr., v. 44, No. 1, 27–33, 4 figs.

The authors have taken the "fly round" figures for *Glossina swynnertoni* in various blocks of bush in the neighbourhood of Shinyanga, Tanganyika, and tried to relate them in a statistical way to various climatic readings. Figures were available for the ten years from 1935: they have been grouped into periods each of two months. The authors consider temperature at a depth of one foot, and the numbers of adult flies two months later, and show that the

distribution is not random, nor can it be expressed by a linear regression : the line giving the best fit is a parabola. It seems that fly numbers are highest two months after the period when soil temperature was 29·0°C. with a range of less than two degrees above or below that figure.

In similar studies on rainfall the authors worked with the annual totals which show a high negative correlation with fly numbers. They emphasize that this is the secondary effect of rainfall which is still observable after its effect upon soil temperature has been eliminated. We are not told whether other climatic elements have been studied in a similar way, but presume that they have and with inconclusive results. The importance of the soil temperature and the rainfall are well demonstrated. The authors took the two formulae that they had worked out and from them alone calculated what fly density would have been expected through the ten years : the observed and calculated figures are in good agreement and do not diverge to a significant extent at any point.

It may be urged, and the authors admit the validity of the point, that neither soil temperature at a depth of a foot nor such an abstraction as a total annual rainfall can be supposed to have a direct effect upon the insect. They are perhaps closely correlated to some other factor which is biologically effective.

The paper includes a tabulation of the actual numbers of *G. savannertoni* caught on the fly rounds through the period. These figures are most valuable in themselves and we think have not been previously published.

P. A. Buxton

Gasq, M. Taux de l'albuminorachie chez l'Africain normal, déterminé par la méthode de Sicard et Cantaloube. Valeur de cette méthode. **Albumin Content of the Cerebrospinal Fluid in Normal Africans : Value of the Sicard-Cantaloube Method.** *Méd. Trop.* Marseilles. 1949. Nov.–Dec., v. 9, No. 6, 973–8.

This work has already been described by the same author elsewhere this *Bulletin*, 1950, v. 47, 447].

Since the method of Sicard and Cantaloube is liable to give incorrectly low cerebrospinal fluid protein values, the author recommends that sleeping sickness patients found by this method to be in the " doubtful " stage (*i.e.*, with protein a little below 25 mgm. per 100 ml. and cells a few more than 3 per cmm.) should be treated as though they are already in the late stage of infection.

E. M. Lourie

Gasq, M. & Lapeyssonnie, L. Les diamidines aromatiques, incidents de traitement, action sur la glycemie. **Aromatic Diamidines : Toxic Reactions and Effects on Blood Sugar.** *Méd. Trop.* Marseilles. 1949. Sept.–Oct., v. 9, No. 5, 785–804, 1 chart.

Gasq has already reported the changes in blood sugar observed after treatment with lomidine in nine uninfected people and in ten first-stage and ten second-stage sleeping sickness patients this *Bulletin*, 1949, v. 46, 918 ; *ibid.*, 1950, v. 47, 447]. The present communication amplifies this information in considerable detail, with reproductions of the actual protocols for each person investigated.

Within 20 minutes of treatment (3 mgm. per kgm. intramuscularly) there was usually, in each type of subject, an increase in blood sugar followed by a steep fall to below the original level, so that in a period of ten minutes the level might fall by as much as 50 per cent. In the uninfected subjects 40 minutes after

treatment, when the level was nearly normal again, a second fall often occurred, reaching its lowest point about ten minutes later. By 75 minutes the normal level was almost restored in all types of subject studied.

The authors think that while most of the well-known toxic reactions to pentamidine are due to its hypotensive effects, some of them, such as vertigo, nausea and vomiting, may be due to the hypoglycaemia produced.

E. M. Lourie

CECCALDI, J., TRINQUIER, E. & ARNOULT, H. Notes sur le traitement des nouveaux trypanosomés à l'Institut Pasteur de Brazzaville pendant l'année 1948. **Treatment of Sleeping Sickness at the Brazzaville Pasteur Institute during 1948.** *Bull. Soc. Path. Exot.* 1950, v. 43, Nos. 3/4, 195–204.

New cases of sleeping sickness treated at the Pasteur Institute at Brazzaville during 1948 amounted to 155, of which 53 were in the lymphatico-blood stage, 18 in the stage of meningeal reaction, and 84 in the meningo-encephalitic stage. The present report describes their treatment and short-term progress, and the table below has been constructed from the information provided. (P.=pentamidine ; L.=lomidine ; T.=tryparsamide ; M.=moranyl. Doses in mgm. per kgm. body weight).

Treatment	Stage of infection	Total followed for 3 to 12 months	Provisional cures	Not improved	Tryps. re-appeared in blood	Died
P.i.m. 5 mgm. ; 1 dose	lymphatico-blood	10	7	3		
	meningeal	3	1	2		
L.i.m. daily : 1st dose 2 mgm., 2nd dose 2·5 mgm. 3rd–8th doses 3·0 mgm.	lymphatico-blood	16	12	3	1	
	meningeal	2	0	2		
P.i.v. daily : 1st dose 1·5 mgm., 2nd dose 1·75 mgm. 3rd – 5th doses 2·0 mgm. ; followed by :— T.i.v. weekly : 12 doses ; ? mgm. per dose	meningeal	3	3			
	meningo-encephalitic	19	13	5		1
P.i.v. 2 mgm. and T.i.v. ? mgm. simultaneously, weekly : 5 doses of each ; followed by :— T.i.v. weekly : 7 doses ; ? mgm. per dose	meningeal	4	4			

i.m.=intramuscular i.v.=intravenous

Treatment	Stage of infection	Total followed for 3 to 12 months	Provisional cures	Not improved	Tryps. reappeared in blood	Died
L.i.v. weekly : 2 mgm., 2 doses ; followed by :— L.i.v. 2 mgm. and T.i.v. ? mgm. simultaneously, weekly : 3 doses of each ; followed by :— T.i.v. weekly : 9 doses ; ? mgm. per dose	meningo-encephalitic	11	6	5		
M.i.v. 10 mgm. and T.i.v. 30 mgm. simultaneously, weekly : 12 doses of each. (Slightly modified in several cases)	meningo-encephalitic	11	5	4		2
M.i.v. ? mgm. and T.i.v. ? mgm., alternately : 3- or 4-day intervals, 12 doses of each	meningo-encephalitic	8	3	4		1

i.v. = intravenous

[The figures in this table do not tally exactly with those given in the authors' " Conclusions ". This is because, in preparing the table, the abstracter has ignored cases which were reported as being well immediately after treatment but were not followed up afterwards.] *E. M. Lourie*

LALOUEL, J. A propos du traitement de la maladie du sommeil par la pentamidine par voie intraveineuse. [**Intravenous Pentamidine in the Treatment of Sleeping Sickness.**] *Bull. Soc. Path. Exot.* 1950, v. 43, Nos. 1/2, 77–83.

The recent papers by CECCALDI *et al.* [this *Bulletin*, 1950, v. 47, 18] on late results of the treatment of sleeping sickness by the intravenous administration of pentamidine have prompted the author to publish data on the same subject which he had submitted in 1948 to the Health Directorate in French Equatorial Africa. The data concern patients whose short-term follow-up results have already been published SALEUN and CHASSAIN, this *Bulletin*, 1948, v. 45, 875). They were treated by two courses of 1·5 mgm. pentamidine daily for eight days, with an interval of one week between the two courses. When followed up six months to two years later, 15 per cent. of 45 patients thus treated in the lymphatico-blood stage were found to have progressed to the stage of nervous involvement. This compares with 19 per cent. and 27 per cent. in the two series described by CECCALDI *et al.* [*loc. cit.*].

The author writes that, in spite of doses of pentamidine which are now recognized to be inadequate, the results were no worse, indeed they were better

them those which were obtained in the lymphatico-blood stage by use of the classical remedies antyrl and orsanine. In a follow-up period of one to two years 24 per cent. of 88 patients treated by these arsenicals were rearmed and in two to three years the failure-rate among 138 similarly treated patients was as high as 38 per cent. Furthermore, parasites are very rarely seen in the blood of patients who progress to the second stage of infection after treatment with pentamidine, so that the parasitological relapse-rate in a two-year period after pentamidine was only 1 per cent., compared with 38 per cent. after the arsenicals.

Referring to Schneider's comment [see last paragraph, Chevallier *et al.*, *loc. cit.*] to the effect that the intravenous route is no longer used for pentamidine and that it limits the amount of pentamidine which can safely be given, the author thinks that this route is nevertheless permissible in selected cases under careful observation. *E. M. Lourie*

Chevallier J., Tessonneau E., Arnoult H. & Mery P. Contribution au traitement de la trypanosomiase humaine par les arsénoxydes. **On the Treatment of Sleeping Sickness by Arsenoxides.** *Bull. Soc. Path. Exot.* 1950, v. 43, Nos. 1/2, 83–92.

The authors first refer briefly to their observations already published on the use of melarsen oxide [see this *Bulletin*, 1950, v. 47, 528]. They then give details of their experience with Friedheim's Mel B and its equivalent, 3854 R.P. or "Arsobal", prepared by the Société Specia [for other reports on Mel B see Friedheim, this *Bulletin*, 1949, v. 46, 711; Le Roux, *ibid.*, 1950, v. 47, 449; Schneider *et al.*, *ibid.*, 449].

The regimen of Mel B was recommended by Dr. Friedheim and consisted of two courses of intravenous injections of 3·6 mgm. per kgm. (with a ceiling of 180 mgm.) every day for four days, with a rest-period of one week between the two courses. Twenty-one patients were treated, all except one in the late stage of infection. There were four deaths, three of which occurred after the first course of injections and one after the second course. These deaths are attributed to toxic action of the drug, which appears to fall most heavily on the liver and central nervous system.

It was found that Mel B has a rapid trypanocidal action, and it usually restores the cerebrospinal fluid quickly to normal, though this improvement is not always maintained over an observation-period of several months. In conclusion the authors describe Mel B as an interesting drug but far too toxic in the dosage used. *E. M. Lourie*

Harding R. D. & Hutchinson M. P. **Mass Prophylaxis against Sleeping Sickness in Sierra Leone: Final Report.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1950, Mar., v. 43, No. 5, 503–12. [10 refs.]

This report is a sequel to an earlier contribution by the same authors [see this *Bulletin*, 1948, v. 45, 440]. The earlier paper described an unusual type of sleeping sickness in the "Fuero area" of Sierra Leone and its control by mass prophylaxis with pentamidine or suramin. Similar control measures were also applied in a "normal" area, where the infection occurred in its classical form. Preliminary results, seven to ten months after prophylaxis, were reported in the earlier paper, and were equally satisfactory in both areas, favouring pentamidine rather than suramin; no infection was found among 1,982 people who had received pentamidine, four infections were found among 1,209 who had received suramin (0·3 per cent.), and 46 were found among 2,878 untreated controls (1·6 per cent.).

The present report deals with later findings in the "Fuero area" and in a large adjacent region in Soa and Gbane Kando chiefdoms which had also been subjected to mass prophylaxis. This adjoining region is not the "normal" area of the previous report, but it was similar in that sleeping sickness there conformed to the usual Sierra Leone type. One year after prophylaxis about 8,500 treated people in the Fuero and surrounding region were examined, together with 3,450 previously untreated "immigrants". The peripheral infection-rate was then found to be 0·07 per cent. among those treated with pentamidine, 0·24 per cent. among those treated with suramin, and 2·4 per cent. among "immigrants"; and the cases of presumptive infection, on the basis of raised cerebrospinal fluid cell counts, among these three groups of cases amounted to 0·87 per cent., 0·58 per cent., and 0·61 per cent. respectively. For the purpose of this report "immigrants" include people who normally live in the region but who happened to be outside at the time of prophylaxis, and they also include infants (some 400) born during the year. "These immigrants formed 25 per cent. of the total in a block of country about 200 miles square containing some 12,000 people. This degree of coming and going is no unusual feature for Sierra Leone and reveals a mass of casual movement natural also to other parts of West Africa. Such movement makes it clear that no area in ordinary circumstances can be satisfactorily protected from re-introduction of the disease if it exists in the surrounding country."

Owing to the unusual characteristics of the disease in the Fuero area, and to a less extent in the surrounding region, it is likely that most, if not all the cases found among those who had received prophylactic pentamidine were already infected but undiagnosed at the time of prophylaxis. Higher doses, between 175 and 400 mgm., of the isethionate intramuscularly did not appear to confer greater protection than one of 175 mgm., and the latter is therefore recommended as the optimum for large-scale use, combining efficacy with freedom from serious side-effects.

In two chiefdoms where a second prophylactic injection of 175 mgm. of pentamidine was given one year after the first one, the population was re-examined about three years after the first injection, and in another chiefdom where there was no second injection, there was likewise a follow-up after three years. The overall incidence was found to be about one-fifteenth of that prevailing before prophylaxis.

The authors' "Discussion" should be read by all who are interested in the use of drugs for the control of sleeping sickness. They write that "On the basis of our own and others' recorded results, we are of the opinion that the stage has been reached when it is justifiable to use mass prophylaxis with pentamidine in suitable epidemics on a large scale with a fair degree of confidence, with the proviso that it should be preceded by particularly careful diagnosis to discover and treat existing cases. We consider also that West African communities so protected may generally be safely left for a whole year after which a repeat examination should be carried out, normally followed by a second mass prophylaxis."

[Dr. Harding's untimely death before this paper appeared in print is a real loss to African welfare and research.] *E. M. Lourie*

Kerneves, H. & Chassain, J. Chimio-prophylaxie de la trypanosomiase humaine par les diamidines en A.O.F. **Chemoprophylaxis of Human Trypanosomiasis by Diamidines.** *Med. Trop.* Marseilles. 1949. Sept.–Oct., v. 9, No. 5, 777–84.

"A.O.F." in the title of this communication is evidently a misprint for "A.E.F.", since the work was not done in French West Africa but in French Equatorial Africa.

Three sectors, one in Oubangui and two in Moyen-Congo, were chosen for large-scale chemoprophylaxis by pentamidine or lomidine during the period June 1946 to February 1949. A preliminary account of the work in Oubangui has already been published (Sallets & Chassain, this *Bulletin*, 1948, v. 45, 875–878). In each sector there was first a thorough diagnostic survey. A full course of curative treatment was given to all those who were found to be infected and prophylactic injections were given to everyone else except to infants under five years of age or less than 15 kgm. in weight, very old or sick people, and women past the fifth month of pregnancy. The injections were given intramuscularly in a dose of 4 mgm. per kgm. for children of five to 12 years and 5 mgm. for older people when the di-isethionate was used, and 3 mgm. and 4 mgm. per kgm. respectively, when the dihydrochloride was used. They were repeated at intervals of six months, the maximum number already given, or about to be given, in any one centre by the beginning of 1949 being four. It is not easy to discover from the report the actual number of people treated, but the total number of injections given over the whole period was 46 255, of which 41 565 were given in 1948 and the beginning of 1949.

There was a rapid decrease in infection rates in all the zones treated, more spectacularly so in areas where the epidemic was thought to be of recent origin, as for example around the Kimongo centre, where the infection appears to have been eliminated by the procedures used.

The authors point out that the favourable outcome of these procedures is not due to the prophylactic treatment alone, but also to the fact that the reservoir of infection is reduced by the concurrent practice of giving full courses of treatment to everyone found to be harbouring the infection. This rarefaction of the virus results also in a significant decrease in the index of new cases in neighbouring unmeasured areas.

The prophylactic treatment seemed to have been rather less effective in infants than in older people. Since 1949 the practice has therefore been to give the same dose per body weight to infants as to adults.

The authors think that the masking of, and consequent difficulty of diagnosing, infections is less likely to occur when pentamidine or lomidine has been used for prophylaxis than when suramin has been used. *E. M. Lourie*

Schneider, R. J. & Kelly, D. R. **Comparison of Two Different Antagonists as Inhibitors of Acriflavine Fastness of Trypanosomes.** *J. Immunology*, 1950, Feb., v. 64, No. 2, 95–9. [11 refs.]

Schneider & Schneider (this *Bulletin*, 1949, v. 46, 915) showed that the trypanocidal action of certain arsenicals and arylides is antagonized by simple esters and amides of substituted benzoic acids such as methyl *p*-hydroxybenzoate and *p*-hydroxybenzamide. They gave reasons for believing that the mechanism of this interference differs from that concerned in the well-known interference with arsenicals and acriflavine by parafuchsin (Browning & Gulbransen, this *Bulletin*, 1922, v. 19, 882). Further evidence, as follows, is now advanced for the view that two different mechanisms are involved.

In one series of mouse-passages a strain of *T. equiperdum* was exposed simultaneously to acriflavine and parafuchsin and in another series it was similarly exposed simultaneously to acriflavine and methyl *p*-hydroxybenzoate. In the first series acriflavine-resistance failed to develop, and in the second it developed in the same way as when the strain was exposed to acriflavine alone. It is therefore probable that the two antagonists exercise their effects by separate mechanisms. There is good evidence that parafuchsin prevents the binding of acriflavine (or arsenicals) to the trypanosome cell, but there is no evidence that the other type of antagonist has such an action. *E. M. Lourie*

FIENNES, R. N. T.-W. **The Cattle Trypanosomiases : some Considerations of Pathology and Immunity.** *Ann. Trop. Med. & Parasit.* 1950 Apr. v. 44, No. 1, 42–54. [23 refs.]

The author reviews especially the immunological and pathological aspects of cattle trypanosomiasis. The two chief trypanosomes are *Trypanosoma congolense* and *T. vivax* and both cause relapsing fevers which may have an acute, chronic or benign course. Cattle usually recover from *T. vivax* infection but *T. congolense* infection is usually fatal ; calves however infected during the first two weeks of life with *T. congolense* recover spontaneously after an illness lasting eight or nine months and are then immune to the infecting strain. The author describes the clinical course of *T. congolense* infection and the lesions found *post mortem* : the lesions include necrosis of cells of the anterior lobe of the pituitary gland, the thyroid gland and the adrenal cortex. He has found *T. congolense* outside the bloodstream in the tissues of the lymphatic glands, the anterior lobe of the pituitary gland and the adrenal cortex and *T. vivax* in the lymphatic glands and pituitary. They were not in the form of nests or islets, but evenly distributed. They were not found in any other tissues in spite of very careful search. Other causes of the degenerative process suggested are anaemia, anaphylaxis, and intracellular developmental forms of the parasites.

In the second part of the paper the author discusses certain well-known conditions which influence the infections—host resistance, adaptability of the trypanosomes to the host, and virulence of the parasites ; the subject of serum- and drug-resistance is purposely omitted. He regards the relapsing character of the infections as connected with differences in individual trypanosomes of a strain and also with the ability of a trypanosome to change the activity of various genes in its antigenic complex. He has found experimentally that antibodies (lysins) attack the nucleus of the trypanosome and that agglutinating sera seemed to be non-specific. The expressed aim of the paper is to give a picture of the pathology and immunity reactions of cattle trypanosomiasis stressing outstanding problems and discussing possible solutions.

J. F. Corson

CURD, F. H. S. & DAVEY, D. G. **"Antrycide"—a New Trypanocidal Drug.** *Brit. J. Pharmacol. & Chemotherapy.* 1950 Mar. v. 5 No. 1, 25–32.

This paper is an amplification of the authors' original announcement of "Antrycide" [see this *Bulletin*, 1949, v. 46, 338]. It deals with their laboratory investigations, the results of field work being due to appear elsewhere.

Among earlier trypanocides the chemical type which seemed to be most worth exploring was that to which "Surfen C" belongs. This is a derivative of 4 : 6 diaminoquinaldine and the authors accordingly sought to link that system with the pyrimidine nucleus which had already been extensively explored in their investigation of antimalarial substances. The work led eventually to "Antrycide", of which the chloride is only slightly soluble and the methylsulphate freely soluble in water. The former salt is much less toxic than the latter on subcutaneous or intramuscular injection, and this is attributed to delayed absorption of the less soluble chloride from the site of injection, associated with its lower solubility. The delayed absorption with consequently long-continued release of the drug from its depot beneath the skin is the basis for the use of the chloride for prophylaxis while the methylsulphate is the salt of choice for curative effect.

The results given for therapeutic tests in mice infected with various trypanosome species, and the results of prophylactic tests against *T. congolense* in mice, are similar to those already reported in the earlier paper [*loc. cit.*].

E. M. Lourie

GOBLE, F. C. **Chemotherapy of Experimental Trypanosomiasis. I. Trypanocidal Activity of certain Bis (2-Methyl-4-Amino-6-Quinolyl) Amides and Ethers.** *J. Pharmacol. & Exper. Therap.* 1950, Jan., v. 98, No. 1, 49–61, 1 fig. [16 refs.]

This is an interesting study on species-specificity of trypanocidal drug action in relation to chemical constitution. In " Surfen C ", also known as " Congasin ", the linkage between two substituted quinoline nuclei is a ring structure, melamine ; in " Bayer 7602 Ac " (MAZZA, COSSIO and ZUCCARDI, this *Bulletin*, 1937, v. 34, 936) it is a branched chain substituent of the dicarboxyllic acid, malonic acid. " Surfen C " is well known to be especially active against *Trypanosoma congolense*, and " Bayer 7602 Ac " against *T. cruzi*.

The author examined the effects on laboratory infections of 23 compounds in which the linkage between the two quinoline (or, more precisely, the two quinaldine) groups consisted of (1) the amides of straight chain or branched chain dicarboxyllic acids ; or (2) related ethers, of the type -0-$(CH_2)_n$-0-. It was found that the compounds with an unbranched linkage were most active against the *T. brucei* group of trypanosomes, but inactive against *T. cruzi*. The branched chain compounds in which the branches were short alkyl chains were only weakly active against the *T. brucei* group but active against *T. cruzi*, activity against the latter increasing with increasing length of alkyl chain. Activity against *T. cruzi* was, however, greatest where one branch was either propyl or allyl and the other contained three or more carbons either in aliphatic or in aromatic arrangements. Peak activity against *T. cruzi* was exhibited by the di-allyl branched compound (" Bayer 7602 Ac ").

None of the compounds exercised appreciable activity against *T. congolense* infections, in spite of the fact that the closely related substance " Surfen C " is active in such infections. And none was active against *Leishmania donovani* infections. *E. M. Lourie*

See also p. 888, GALLIARD, BRUMPT & MARTINEZ. **Infections expérimentales à *Trypanosoma cruzi* Chagas chez l'homme à propos de la biothérapie du cancer.**

LEISHMANIASIS

MOHIUDDIN, A. **An Investigation into the relationships between the generally accepted Species of the Genus *Leishmania* Ross, 1903.** [Thesis for Ph.D. (Protozoology), University of London.] 1948. 97 typed pp., 9 pls. [Numerous refs.]

The exact relationships between members of the genus *Leishmania* parasitic in man, of which a number of distinct species are generally recognized, has been the subject of numerous papers. Attempts have been made to differentiate the parasites associated with various forms of leishmaniasis morphologically, culturally, serologically, and by other means, but the results were conflicting. In practice, therefore, the identity of the leishmanias is determined by the clinical picture of the case from which they were obtained.

In the present thesis the author reports the results of a detailed study carried out with the object of verifying the validity of the accepted species of *Leishmania*, using 12 different strains belonging to the species *L. donovani*, *L. infantum*, *L. chagasi*, *L. tropica*, and *L. brasiliensis*. These were cultivated in N.N.N., which was found to be the most reliable and satisfactory medium. Penicillin (1,000 units per cc.) was used effectively to check contamination of the cultures. A study of the morphology of the flagellates in culture confirmed

the correctness of the accepted view that various species of *Leishmania* are morphologically indistinguishable, but a statistical study of four strains (*L. donovani*, *L. tropica*, *L. chagasi*, *L. brasiliensis*) showed that, although the distribution of various measurements overlapped and could not therefore be used alone to distinguish the strains, it was possible to differentiate them by using a linear discriminant function.

A study of the behaviour of the flagellates in culture revealed differences between *L. tropica* and *L. donovani*. Though there was a tendency for the flagellates of both species to form clumps, in the former they consisted of almost symmetrical rosettes, while in the latter they consisted of large tangled masses of flagellates. Serological tests have shown that an anti-serum prepared against any one organism agglutinated the homologous organism to a high titre, while the heterologous organisms were also agglutinated but to a much lower titre. These results point to the presence of both common and specific antigens in all the strains of *Leishmania*, and it was found that they could not be differentiated by agglutination tests.

The comparative pathogenicity of various strains of *Leishmania* was studied in experimental infections of hamsters inoculated intraperitoneally and subcutaneously. They failed to reveal any clear-cut differences in the virulence of these strains for the rodents. The morphology of the flagellates, their behaviour in culture and in experimental animals, are well illustrated by figures and photomicrographs. From this investigation it is concluded that the existing species of *Leishmania* do not represent " good " and valid species, but should be assigned to three subspecies corresponding to *L. donovani*, *L. tropica* and *L. brasiliensis* (*L. infantum* and *L. chagasi* merging with *L. donovani* as synonyms). If the author's suggestion is adopted, the nomenclature of these subspecies would be as follows : *L. donovani donovani*, *L. donovani tropica* and *L. donovani brasiliensis*.]

This paper deals very thoroughly with an important and interesting problem. It is hoped that it will be published and thus made available in its entirety to those interested in the subject. For later work on this subject, see KIRK, this *Bulletin*, 1949, v. 46, 621 ; 1950, v. 47, 725.] *C. A. Hoare*

GHOSH, H., GHOSH, N. N. & RAY, J. C. **Further Studies on Complement-Fixation Reaction in Kala-Azar with a Specific Antigen as an Aid to Diagnosis.** *Ann. Biochem. & Exper. Med.* Calcutta. 1949, July–Sept., v. 9, No. 4, 173–8.

The antigen used in these studies was prepared by several different methods, from flagellate cultures of *Leishmania donovani* primarily grown in N.N.N. medium and subcultured in " Ray's " medium. The best method and the one that was employed in the tests reported was as follows :—

An emulsion of a 72-hours' growth of flagellates was made in distilled water in a proportion of one in 50, about 80 million organisms per ml. Phenol, 0·5 per cent., was added. The emulsion was left in the incubator at 37°C. for 25 days in a stoppered bottle with some sterile sand, the bottle being taken out every day and shaken for two hours in a shaking machine. Finally, the emulsion was centrifuged and the supernatant fluid kept in the incubator as antigen. The test with rabbit antiserum showed positive fixation in diltuions of one in 4,000 to one in 6,000. The titre remained unaltered for ten months to 1½ years.

The complement-fixation test was carried out in 1,038 cases. The test was positive in 194 cases ; of these 192 were cases of kala azar, of which 66 had been proved by the finding of parasites, and two gave a past history of kala azar. The test was doubtful in three cases of kala azar, one cured case of kala azar and one case of leucoderma. It was negative in 839 cases of which

two were cases of untreated kala azar, ten treated cases of kala azar and 827 were normal controls or patients with some other disease.

It is pointed out that the test is positive early in the disease before the aldehyde test becomes positive. *L. E. Napier*

Schmidt, H. **An Advance in the Therapeutics of Pentavalent Antimony : Solustibosan (Sodium Antimony Gluconate).** *J. Trop. Med. & Hyg.* 1950, May, v. 53, No. 5, 95–103. [73 refs.]

Sodium antimony gluconate, or antimony hexonate, was introduced by the Bayer firm before the recent world war, first under the designation of " Sdt 561 " and then of " Solustibosan ". Earlier pentavalent antimonials of proved therapeutic value were aromatic compounds, the antimony being attached to the benzene ring, but in Solustibosan the antimony of antimonic acid is attached by an oxygen linkage to the aliphatic substance, gluconic acid. Many investigations have been reported in recent years with preparations produced to the pattern of Solustibosan, these preparations bearing the usual confusing abundance of synonyms and trade names. For the sake of completeness in his survey, the author includes observations made with these other preparations, which he groups together under the abbreviated designation of " SAG ", but he emphasizes that he cannot guarantee complete identity between any of these preparations and the authentic Solustibosan. He comments that in the *British Pharmaceutical Codex*, 1949, the formula given for " Sodii Stibogluconas " is only an uncertain approximation to that of Solustibosan.

The survey is well furnished with references to the literature, and it covers the chemistry of the subject, limited pharmacological information, and the results of tests in laboratory infections and in leishmania and filaria infections in man. It is mentioned also that useful results have been reported in trench fever and in multiple sclerosis.

The special advantages claimed for Solustibosan over previously highly-prized antimonials, such as Neostibosan, are that it is a much simpler and cheaper substance, it is more stable, much less toxic, and painless on intramuscular injection. The low toxicity, associated with rapid excretion, makes it relatively safe to give intensive courses of treatment, while those who regard rapid elimination as undesirable may resort to a stable suspension in oil (" Solustibosan ol."). A concentrated solution (" Solustibosan sol.") containing 54 mgm. Sb per ml., compared with 20 mgm. per ml. in the original preparation, is now available, and the author remarks that it would be of interest to try Solustibosan sol. or ol. in intensive courses of treatment for human filariasis, as has been done for kala azar. *E. M. Lourie*

Benhamou, E., Albou, A., Destaing, F. & Puglièse, J. Sur deux cas de kala-azar, l'un de l'adulte, l'autre de l'enfant, suivis et guéris sous le contrôle de l'électrcophorèse. [**Two Cases of Kala Azar successfully treated and controlled by Electrophoresis.**] *Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1949, No. 25, 1091–8, 9 figs. on 2 pls.

In his earlier studies of the serum proteins in kala azar [this *Bulletin*, 1932, v. 29, 115] the first author did not have the advantage of the electrophoretic method by which the serum proteins can be estimated so rapidly and with such precision. Later, in 1947, he observed that kala azar was not only characterized by hypergammaglobulinaemia, but by the presence in the serum of a protein fraction " x " more rapid than the albumin fraction, and, sometimes in the gamma band by a new slower band. Moreover, one can follow the development of the disease and the reactions to treatment by this precise method of electrophoresis : two examples are given :—

A woman of 44 years had irregular fever for seven months. She was treated by quinine without success. She then developed a pleural effusion. She lost 22 kilogrammes in weight. The spleen was enlarged down to the iliac crest and the liver was five finger-breadths below the costal margin. Kala azar was considered : the formol-gel reaction was positive in 30 seconds and electrophoresis showed a considerable increase of gamma globulin (44·95 per cent.) and the presence of the " x " fraction. Leishmania were demonstrated by sternal puncture.

She was treated by " glucantime ", an antimony preparation [this *Bulletin*, 1950, v. 47, 342], in increasing doses from 2 to 20 ml. but on account of reactions —vomiting and a severe erythema—this was discontinued and Neostam [described as "*un stibogluconate de sodium*"] was substituted. The spleen decreased in size rapidly, but the pleural effusion increased and the temperature remained, but changed to a single daily rise. The diagnosis of tuberculosis was confirmed by guineapig inoculation. However, the electrophoretic reading was now virtually normal, the gamma globulin being only 25·30 per cent. and the albumin 56·02 per cent. and the " x " fraction absent. After this only calcium and dietetic treatment were given ; the temperature gradually fell and the spleen and liver subsided.

The second case was that of a child of six similarly diagnosed as kala azar by sternal puncture. The formol-gel reaction was negative but the electrophoretic estimation of the proteins showed that there was an increase of gamma globulin and the presence of the " x " fraction. No improvement was produced by glucantime. The gamma globulin was now 53·42 per cent. A course of pentamidine was started and clinical improvement followed : three weeks later the gamma globulin was reduced to 47·59 per cent. and after two months to 41·94 per cent. However, within two months there was a clinical relapse with return of fever, but leishmania could not be demonstrated. The electrophoretic reading later showed that the gamma globulin had again increased to 45·66 per cent. and the " x " fraction had reappeared. After a second course of glucantime there was clinical improvement and a gradual return of the electrophoretic readings to normal : four months after the relapse the electrophoretic reading was normal. This patient had altogether six courses of treatment, two of glucantime and four of pentamidine.

The author considers that the electrophoretic reading with its characteristic picture of a very high gamma globulin and the presence of the " x " fraction is of the greatest value not only in the initial diagnosis of kala azar but in recording progress towards cure, and in the latter case is even more reliable than the searching for leishmania. [See also this *Bulletin*, 1950, v. 47, 611.]

L. E. Napier

D'Alessandro, G., Burgio, G. R. & Mariani, M. Commento all'attuale recrudescenza della leishmaniosi viscerale a Palermo. Prospettive della lotta contro i flebotomi a mezzo del D.D.T. [**A Note on the present Recrudescence of Visceral Leishmaniasis in Palermo. Prospects of controlling *Phlebotomus* by means of DDT.**] *Riforma Med.* 1947. Nos. 21/22, 12 pp., 3 figs. Summary taken from *Rev. Applied Entom.* Ser. B. 1950, May, v. 38, Pt. 5, 77.]

An outbreak of visceral leishmaniasis occurred in Palermo in 1944 and 1945, when more than twice the usual number of cases were reported. There had been no increase in the number of dogs in the city, and though *Phlebotomus* was very common, *P. perniciosus*, Newst., the usual vector of the disease in the Mediterranean area, could not be found, more than 3,000 sandflies taken

over three years all proving to be *P. papatasi*, Scop. The sandfly population began to increase in March and reached a sharp peak in late August, but the number of cases declined throughout this period and did not increase again until October, when sandflies were becoming scarce. Despite this and the fact that *P. papatasi* does not transmit visceral leishmaniasis elsewhere, it is considered to have been the local vector, and the discrepancy between its frequency and the seasonal distribution of cases is explained on the hypothesis of a prolonged incubation period for the disease.

Since female sandflies rest on ceilings and reach their sleeping human hosts by a series of short flights down the walls, the possibility of protecting sleepers by fastening broad strips of paper bearing deposits of DDT horizontally along the parts of the walls by the beds was tested. Paper of the newsprint type was treated with a 5 per cent. solution of DDT in kerosene at 20 cc. per sq. metre, allowed to dry and put up in four bedrooms on 14th September. The *Phlebotomus* population was falling at the time, but sandflies were taken in four untreated control bedrooms until the end of October. None was taken in the treated rooms after 16th September. The treatment also gave complete protection from *Aëdes aegypti*, L., which was increasing in numbers at the time.

FEVERS OF THE TYPHUS GROUP

Bovarnick, Marianna R., Miller, Judith C. & Snyder, J. C. **The Influence of certain Salts, Amino Acids, Sugars, and Proteins on the Stability of Rickettsiae.** *J. Bacteriology*. 1950, Apr., v. 59, No. 4, 509–22. [14 refs.]

This paper will interest workers engaged in special studies in which it is desirable to maintain the viability of purified rickettsiae as long as possible, especially for use in animal assays and in attempts to cultivate the organisms *in vitro*. These workers will desire to read the original paper.

As a result of numerous experiments, the authors have found that the following medium is useful for the preservation of purified rickettsiae for several hours at room temperature or at 0°C., and during the process of freezing and thawing.

Sucrose, 0·218 M ; KH_2PO_4, 0·0038 M ; K_2HPO_4, 0·0072 M ; and glutamate, 0·0049 M.

The addition of 1·0 per cent. of serum albumin is a further improvement.

John W. D. Megaw

Weyer, F. Über die Wirkung von " Tego 103 " auf Rickettsien. (Zugleich ein Beitrag zur Frage der Empfindlichkeit von Rickettsien.) [**The Action of " Tego 103 " on Rickettsiae.**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1950, Apr., v. 1, No. 4, 586–94. [17 refs.]

" Tego 103 " is described as a new substance having a powerful antiseptic and detergent action. It contains high-molecular derivatives of amino acids and is made by the firm Th. Goldschmidt, A. G., of Essen.

It acts equally on Gram-positive and Gram-negative bacteria ; the author has used it with great success in his laboratory for general disinfection of hands, instruments, vessels, etc., and believes that it has been a valuable safeguard against infection by rickettsiae.

Experiments are described from which it appears that epidemic and murine rickettsiae are killed by exposure to solutions within five minutes, whereas similar solutions (2 to 5 per cent.) fail to kill *Rickettsia burneti* in 24 hours, but are lethal in 48 hours.

The great resistance of *R. burneti* is regarded as indicating some degree of biological relationship to the viruses. No undesirable effect on the skin was noted after several months' use of " Tego 103 " for washing hands.

John W. D. Megaw

Worms, R. Trois cas sporadiques de typhus épidémique observés à Paris. [**Three Sporadic Cases of Epidemic Typhus Fever in Paris.**] *Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1950, Nos. 1 /2, 54–7.

The three cases described were sporadic ; they occurred over a period of 18 months. Each patient had lived at some previous time in an area in which typhus fever was present in epidemic form ; in one case there was a history of a previous attack in Russia in 1932.

The diagnosis of epidemic typhus was confirmed by laboratory tests. In the absence of louse infestation or of any likely source of recent infection it was believed that the cases were of the Brill type and were the result of a flare-up of a persisting infection.

John W. D. Megaw

Kalra, S. L. & Rao, K. N. A. **Typhus Fevers in Kashmir State. Part I. Epidemic Typhus.** *Indian J. Med. Res.* 1949, Oct., v. 37, No. 4, 395–400.

Epidemic typhus fever appears to have been endemic in Kashmir for many years ; the largest recorded epidemic was in 1943–44 when there were 2,481 cases and 730 deaths ; infection was believed to have been introduced by 5,000 refugees from Russian territory.

The present study deals with two small outbreaks which conform to one of the common patterns. In the first outbreak there were 53 cases in two refugee camps and infection was traced to a refugee from an endemic area. The second outbreak consisted of ten cases in three houses of a village where an outbreak occurred in 1945. One of the cases was diagnosed as murine typhus on the strength of a complement-fixation titre higher with murine than with epidemic antigen, but no other evidence is given to show that the infection had a different origin from that of the other cases in the same outbreak.

From three out of five blood samples strains of rickettsiae were isolated ; all three were orchitic during the earlier passages through guineapigs, but ceased to be so after several passages.

Two strains isolated from lice collected from patients were non-orchitic from the outset, though they caused ascites in the first three or four passages through guineapigs.

There were six deaths, all among patients over 30 ; the nine cases among children under 14 were very mild and would hardly have been diagnosed but for the occurrence of obvious cases among the older members of the families.

John W. D. Megaw

v. Bormann, F. Hinterlässt das Fleckfieber eine lebenslängliche Immunität ? [**Does Life-long Immunity persist after Typhus Fever ?**] *Deut. med. Woch.* 1950, June 16, v. 75, No. 24, 826–7. [10 refs.]

In a Russian village in which louse-borne typhus fever had long been prevalent a close enquiry was made into the incidence of attacks of the disease during the epidemic period 1941–43.

Among 259 persons who gave definite histories of previous attacks 66 (25·5 per cent.) were again attacked ; 15 of the attacks were severe and 11 were abortive ; there were no deaths.

Among 152 persons who denied having had previous attacks there were 79 cases (52 per cent.) ; of these 35 were severe, none were abortive, and there were six deaths.

The incidence of the disease was higher among those previously attacked before 1918 than in those attacked during the epidemics of 1918–22 and 1933–34 ; in the first of these groups it was 32·78 per cent. ; in the second it was 25 per cent., and in the third it was 18·2 per cent. The shortest interval between the first and second attacks was seven or eight years, and the conclusion reached was that a high degree of immunity persisted for about ten years and gradually became less, so that there is no question of the occurrence of complete lifelong immunity.

Russian medical men and some patients stated that three attacks sometimes occur in the same person. *John W. D. Megaw*

Kalra, S. L. & Speechly, C. G. J. **Weil-Felix and Complement-Fixation Test after Typhus Vaccine.** *Indian J. Med. Res.* 1950, Jan., v. 38, No. 1, 1–2.

The authors, in New Delhi, gave two doses of Cox type combined epidemic and murine typhus vaccine to 42 healthy soldiers ; each dose consisted of 1 cc. and there was an interval of one week between them.

Before vaccination, tests for *Proteus OX19* agglutinins were made and one week after the second dose this test was repeated together with complement fixation tests (epidemic and murine antigens).

In 14 of 30 cases, the complement fixation test became positive. In 24 of the 42 persons, a rise in *OX19* agglutinins occurred and 17 of these had a titre of 1/40 or more. The maximum titre was 1/320. The two reactions were independent of each other and there was no correlation between the titre of complement-fixing antibodies and *OX19* agglutinins.

The results are shown in a table : of 30 persons tested with both reactions, 23 were positive in one or both : of the positives, nine had a rise in agglutinins but a negative complement-fixation, three developed a positive complement-fixation, with no rise in agglutinins and 11 were positive in both reactions.

The authors refer to the findings of Franke [this *Bulletin*, 1948, v. 45, 777] who obtained rises in *OX19* agglutinins in 90 per cent. of cases four to five days after the third dose of Cox type vaccines. The vaccine used by the present authors was 22 months old : this may partly explain their low figures, but they note that even after that lapse of time the vaccine had retained some of its potency. *H. J. O'D. Burke-Gaffney*

Gimeno de Sande, A. Campaña profiláctica contra el tifus exantemático en Motril durante el año 1947. [**The Prevention of Exanthematic Typhus in Motril in 1947.**] *Rev. Sanidad e Hig. Pública.* Madrid. 1948, Apr., v. 22, No. 4, 342–57, 3 figs.

The author believes that epidemic typhus fever is constantly present in endemic form in the Mediterranean coastal region of Spain, from Almeria to Malaga, and also in some small foci in the interior of the country.

The seasonal incidence of the disease in Motril is remarkable ; less than 20 per cent. of the cases reported from 1871 to 1946 occurred during the six-month period September to February. In March the number of cases rose

sharply, reaching the maximum in May, in which month 22 per cent. of all the cases occurred. The special prevalence in spring is believed to be due to the overcrowding of the region by louse-infested workers engaged in harvesting the sugar-cane crop. The disease was controlled in 1947 by powdering the workers with DDT, and by the use of hydrocyanic acid gas.

John W. D. Megaw

Gimeno de Sande, A. Campaña profiláctica contra el tifus exantemático en Motril, Salobreña y Almuñécar durante el año 1948. [**The Prevention of Exanthematic Typhus in Motril, Salobreña and Almuñécar, in 1948.**] *Rev. Sanidad e Hig. Pública.* Madrid. 1949, May, v. 23, No. 5, 443–9.

In 1948 the chief method of louse control was the use of a spray ; 25 per cent. solution of DDT or Gammexane in benzol. This was found much more effective than the 10 per cent. powder used in the previous year. A single application with a nebulizer gave complete control, whereas the powder had to be applied three times to give the same result. There was a great saving in cost and labour and the eggs were killed as well as the lice.

As many as possible of the huts and other buildings were " dedetized " before being occupied.

No case occurred in any of the three areas ; in the previous year there had been 72 cases.

There was a satisfactory degree of control of fleas, mosquitoes, flies and cockroaches.

John W. D. Megaw

Gimeno de Sande, A. Campaña profiláctica contra el tifus exantemático en Motril, Salobreña y Almuñécar durante el año 1949. [**The Prevention of Exanthematic Typhus in Motril, Salobreña and Almuñécar in 1949.**] *Rev. Sanidad e Hig. Pública.* Madrid. 1949, Nov.–Dec., v. 23, Nos. 11/12, 907–16.

Kalra, S. L. & Rao, K. N. A. **Typhus Group of Fevers in Jubbulpore Area.** *Indian J. Med. Res.* 1949, Oct., v. 37, No. 4, 373–84, 2 graphs.

The study described in this paper forms part of a plan for the investigation of fevers of the typhus group known to be prevalent among troops stationed or camping in certain localities in India.

Between November, 1946 and April, 1947, the authors studied 11 cases of murine typhus which occurred at Jubbulpore among the troops ; there was one case of tick typhus which in its clinical aspects " could be called a mild case of Rocky Mountain spotted fever ".

No case of scrub typhus was detected.

Among the murine typhus cases, seven had the *Proteus OX2* type of agglutination at titres of 1–500 to 1–5,000, the *OX19* titre never exceeding 1–125, and being zero in the two cases in which the *OX2* titre was 1–5,000.

Three cases gave the *OX19* type of response.

The patient with tick-typhus agglutinated *OX2* at 1–1,000 on the 22nd day and gave a negative reaction with *OX19* and *OXK*.

Four strains of rickettsiae were isolated from patients ; the strain of tick typhus was diagnosed by a positive complement-fixation reaction against Rocky Mountain spotted fever antigen and a negative reaction against epidemic and murine antigen.

An interesting finding was the recovery of a strain of murine rickettsiae from a tick, *Boophilus australis*, collected near a military camp. This is said to be

the first time that a tick has been found naturally infected with murine rickettsiae and that " the possibility of ticks conveying murine typhus becomes an open question ".

In the epidemiological investigation two murine strains were isolated from batches of fleas each of which contained *Xenopsylla cheopsis* and *X. brasiliensis* collected from rats trapped in Jubbulpore.

One strain of *R. orientalis* was isolated from rats and another from field mice ; these strains died out when transferred through a series of white mice.

No rats were examined for murine rickettsiae.

Collections of ticks were made from animals, fields, and forests, in the area ; in random samples of ticks from each habitat the predominant species was *Boophilus australis* ; next, but far behind, came *Hyalomma*, then *Rhipicephalus*, and last of all, *Haemaphysalis* ; the species of the last three is not stated.

Mites were collected from rats, field-mice, and shrews, in a forest area ; considering the season the rate of infestation was considered heavy ; 70 per cent. of the total catch were *Trombicula deliensis* Walch.

No infection was found among 20 batches of mites that were examined.

John W. D. Megaw

LEY, H. L., Jr., WOODWARD, T. E. & SMADEL, J. E. **Chloramphenicol (Chloromycetin) in the Treatment of Murine Typhus.** *J. Amer. Med. Ass.* 1950, May 20, v. 143, No. 3, 217–19, 2 figs. [Refs. in footnotes.]

Three confirmed cases of murine typhus in Malaya were found to respond to treatment by chloromycetin in exactly the same way as cases of scrub typhus. The temperature fell to normal in 36, 40, and 60 hours respectively ; the treatment was started on the 11th, 7th, and 8th days in the corresponding cases.

The total duration of the fever in four comparable untreated cases was 14 to 16 days. No toxic manifestations were noticed.

The treatment provisionally recommended is an initial dose of 60 mgm. per kilo of body weight, then doses of 0·25 gm. every three hours for 48 hours or till the temperature becomes normal.

An interesting point is that the complement-fixation reaction with an antigen consisting of washed rickettsiae became positive in only one of the seven patients by the 20th day, though on that day the Weil-Felix and rickettsia-agglutination reactions were positive in every case at high titres. *John W. D. Megaw*

GISPEN, R. **The Rôle of Rats and Mites in the Transmission of Epidemic Scrub Typhus in Batavia.** *Documenta Neerlandica et Indonesica de Morbis Tropicis.* Amsterdam. 1950, Mar., v. 2, No. 1, 23–35, 1 map, 2 figs. & 1 graph. [16 refs.]

The author has investigated the epidemiology of scrub typhus in Batavia by comparing his observations of the vegetation, rodent population and mite population in three parts of the city. One of these parts is an epidemic district for scrub typhus and the other two are not. Various rodents and shrews are found in all districts and so is the mite *Schöngastia indica*. The mites *Schöngastia pseudoschüffneri* and *Walchia glabrum* are restricted to these areas where alang grass is found. *Trombicula akamushi* is only found in the epidemic area and is associated with the alang grass in that area. Some of the cases of scrub typhus in residents in non-epidemic areas can be shown to have arisen in the epidemic area.

Attempts were made to investigate the natural infection. Mice exposed in alang grass in the epidemic area showed no symptoms of scrub typhus. The presence of the scrub typhus pathogen could not be demonstrated by the

inoculation of emulsified *Schöngastia indica* into laboratory animals although other species of *Rickettsia* were isolated. A strain of *Rickettsia orientalis* was isolated from an emulsion of four house-rats from the epidemic area.

The author concludes that *Trombicula akamushi* is the vector of scrub typhus in Batavia and not *T. deliensis* as in Sumatra. Although one batch was found to be infected, house rats are probably not the reservoir, as their rate of infection is characteristically low. Epidemic scrub typhus in Batavia is therefore not connected with an epizootic or enzootic among rats. Small mammals other than rats and birds may carry infected mite larvae from rural to urban districts.

J. H. Sudd

Plooij, M. Scrubtyphus. [**Scrub Typhus.**] *Nederl. Tijdschr. v. Geneesk.* 1950, May 27, v. 94 (ii), No. 21, 1490–98, 5 charts & 1 map. [Refs. in footnotes.] English summary (4 lines).

This clear and succinct description of scrub typhus is based on observation of 40 patients treated at the Military Hospital of Falembang, South Sumatra, in 1948 and 1949.

Only four of the patients had an eschar. Special importance is attached to generalized lymphadenitis as an aid to differentiation from typhoid fever. There were five deaths.

The chief feature of the paper is a description of the results of treatment of 10 patients with para-aminobenzoic acid (PABA), which has now been largely superseded by chloromycetin and aureomycin.

Good results were obtained in the later cases in which the blood concentration of PABA was maintained at 60–70 mgm. per cent. *John W. D. Megaw*

Smadel, J. E. **Chloramphenicol (Chloromycetin) and Tropical Medicine.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1950, May, v. 43, No. 6, 555–74, 12 figs. [20 refs.] Discussion 575–82 [Lewthwaite, R.; Fleming, A.; Florey, H.; Felix, A.; Selbie, F. R.; Findlay, G. M.; Cruickshank R.; Smadel, J. E. (in reply)].

In this paper the author gives a comprehensive summary of the history of chloromycetin (chloramphenicol) from the isolation in 1947 of the organism from which the drug was promptly obtained in crystalline form, and was soon found to inhibit the growth of many microbial agents, including the pathogenic rickettsiae.

The workers of the Parke Davis Research Laboratories, by whom the drug was isolated, state that it is the first naturally occurring compound produced by living tissues which has been found to contain a nitro group and to be a derivative of dichloracetic acid. Mention is made of the synthesis of the drug and of its production as a successful commercial undertaking in 1949.

The author is well known as the outstanding worker in the clinical tests of the drug; with various collaborators he has written ten papers, most of which have already been reviewed in this *Bulletin*. The essential matters dealt with in these papers are now made available in a concise and attractive form.

The mode of action of the drug in scrub typhus is discussed at some length. Special reference is made to its prophylactic effect and to the remarkable frequency with which relapses occurred among volunteers whose treatment was started on the average 3·4 days after the onset of the illness. This feature is in striking contrast to the complete freedom from relapses of naturally occurring cases in which treatment was started on the average 7·1 days after the onset. The author has now definitely suggested that adequate immunization does not

occur till a sufficient amount of antigen has been produced in the body, so that when the drug is given early its rickettsiastatic effect inhibits the formation of antibodies and therefore delays the development of immunity.

[There seems to be no essential difference between the disease in persons intentionally exposed to infection in hyperendemic areas and the disease occurring in accidentally infected persons, so that the problem of treatment is to combine the advantages of early suppression with those of delayed treatment in which freedom from relapses is associated with a reduction in the total period of invalidism. The latter method involves some degree of risk of damage to the tissues, or even of a fatal result, and therefore will not appeal to medical men whose instinct is to play for safety. The same problem arises in connexion with the use of the drug in prevention ; it is not a true prophylactic but has only a suppressive action.]

It is interesting to learn that the author contemplates experimental work on the production of immunity by inoculation with living rickettsiae followed by treatment planned in such a way as to prevent serious illness without interfering with the production of antigens.

The author points out that aureomycin produces therapeutic and suppressive results similar to those observed in the case of chloromycetin.

Chloromycetin was tested in the treatment of 45 cases of typhoid fever. The average duration of the fever among the 44 patients who recovered was four days after the administration of the first dose, and was much the same whether treatment was started early or late. The course of treatment finally adopted was an initial oral dose of 3·0 to 4·0 gm. followed by 1·5 gm. twice daily till the temperature became normal and single daily doses of 1·5 gm. for seven days, and then single daily doses of 1·0 gm. till the 14th day of the treatment.

Among 13 cases in which the treatment lasted nine days or less there were seven relapses which occurred 8 to 16 days after the last dose ; among the 31 patients treated for more than nine days there was no relapse.

Two of the patients had perforation of the intestine on the 21st day of the illness ; this was the 3rd and 4th day of the treatment respectively ; both patients recovered without operation. Four patients had haemorrhages. The patient who died had been under treatment for four days, he had repeated haemorrhages, perforation and pneumonia. At the autopsy it was found that the perforation had caused only a small localized area of peritonitis.

Treatment seemed to have had no influence, positive or negative, on the persistence of infection after recovery.

The other diseases, apart from rickettsial, in which the drug was found effective are stated to be—gonorrhoea, lymphogranuloma venereum, granuloma inguinale, and syphilis ; benefit was said to have resulted in brucellosis and tularaemia.

In the discussion of the paper Dr. R. Lewthwaite mentioned very promising results in trachoma from local applications of aureomycin, and in one case from chloromycetin given by the mouth.

Sir Alexander Fleming stated that most urinary and other infections, even those due to proteus and pyocyaneus types of organisms, yielded to chloromycetin.

Dr. A. Felix stressed the value of the titration of the heat-stable *Proteus OXK* antibodies as carried out by the author, but said that he thought it quite erroneous to regard these as non-specific for the rickettsiae ; he said that the *OXK* antigens ought to be taken into account as well as the heat-labile antigens of which he knew three or four different types to occur in scrub typhus. He feared that the results of treatment of typhoid fever by chloromycetin were much less favourable than those obtained in typhus ; he mentioned that in an

outbreak in England in 1949 the only persistent excreter of typhoid bacilli was one of the patients who had received two courses of chloromycetin ; this patient was still excreting bacilli after nine months and was likely to remain a chronic carrier.

Dr. G. M. Findlay stated that aureomycin had a remarkable curative action in phagedaenic tropical ulcer and secondary yaws.

In replying to the discussion Dr. Smadel said that among about 100 cases of scrub typhus *Rickettsia tsutsugamushi* had been isolated in about 90 per cent. ; the *OXK* reaction was positive in convalescence in about 80 per cent., and the complement-fixation test was positive in less than 50 per cent. ; probably because of marked variations among the specific rickettsial antigens.

John W. D. Megaw

DE MAGALHÃES, O., FREIRE, S. A. & ROCHA, A. Ensaios terapêuticos no tifo exantemático neotrópico no Brasil. (Nota prévia). [**Therapeutic Tests in the Neotropical Typhus of Brazil.**] *Brasil-Medico.* 1950, Feb. 4–25, v. 64, Nos. 5/8, 31–2.

This is a preliminary note in which the author states briefly the results observed in trials of various drugs in the prevention and treatment of the deadly tick-borne typhus of Brazil.

Most of the tests were on groups of animals inoculated with the rickettsiae. No appreciable benefit was observed with penicillin, para-aminobenzoic acid, streptomycin, paludrine [proguanil] or aralen [chloroquine].

With aureomycin, four out of 16 guineapigs recovered after treatment with varying doses at various stages of the illness : the drug caused wasting, loss of appetite and constipation ; the temperature fell by crisis. With chloromycetin six out of 15 guineapigs survived ; no toxic effects were observed. A vaccine widely used in Minas Gerais was tested on three guineapigs, which remained unprotected.

The general conclusions reached were :—(1) that aureomycin and chloromycetin could be recommended as effective curative drugs ; (2) that there was no evidence to show that the vaccine was protective ; and (3) that the best line of defence was the control of ticks and bugs by the modern insecticides.

John W. D. Megaw

MÄKINEN-FOREL, M. A propos d'une épidémie de fièvre " Q ". [**An Epidemic of Q Fever.**] *Schweiz. med. Woch.* 1950, June 3, v. 80, No. 22, 569–72, 2 figs. & 1 diagram. [30 refs.]

The author describes an epidemic of Q fever which broke out in June 1947, during a spell of very hot and dry weather in a detached wing of the Mental Diseases Hospital at Bel-Air, Geneva.

Among 60 persons in the affected wing, 87 per cent. were attacked between June 19 and July 7.

The hospital as a whole consisted of completely detached wings but the nursing staff worked in the different wings according to a fixed rotation. Nine per cent. of the population of the hospital were attacked. The incidence was as follows :—28 mental patients (6 per cent.) ; 25 of the nursing staff (42 per cent.) ; four of the seven doctors ; two male nurses, a pharmacist and a laboratory attendant.

The clinical picture showed the usual variations. The only complication was pulmonary involvement, which occurred in 40 per cent. of the cases. There was a rash in about half of the cases ; it consisted of large scarlatiniform macules on the whole of the trunk or restricted to the dorsal and dorso-lumbar regions. It lasted one to three days.

Four very old and debilitated patients died ; some attacks were abortive, the fever lasting less than 24 hours.

The most likely mode of infection was by dust, but the source from which this became infected remained a mystery.

The diagnosis was established by complement-fixation tests, carried out six months after the epidemic occurred.

It is stated that several small outbreaks and isolated cases have occurred in Geneva at a later date. *John W. D. Megaw*

PEREZ GALLARDO, F., CLAVERO, G. & HERNÁNDEZ FERNÁNDEZ, S. Hallazgo en España de la " Rickettsia burneti " agente etiológico de la fiebre " Q ". **Isolation of *Rickettsia burneti* in Spain.** *Rev. Sanidad e Hig. Pública.* Madrid. 1949, June, v. 23, No. 6, 489–96, 5 figs. (2 on pl.). [18 refs.]

In this paper, which is a model of clear presentation, the authors describe the methods employed in the isolation of three strains of *Rickettsia burneti* from three species of wild ticks. Two of the species, *Hyalomma marginatum* and *Rhipicephalus bursa* were collected from calves in Seville ; the third species, *Rhipicephalus sanguineus* was collected in Madrid from the dormouse, *Eliomys quercinus*.

During 1948 and 1949 more than 9,000 ticks were tested in batches by guineapig inoculation and yolk-sac culture. The yolk-sac cultures became positive on the 2nd to the 4th transfer, and thereafter the transfers were easily maintained.

The identity of the strains was confirmed in each case by complement-fixation tests of the infected guineapigs ; the antigens employed were the Nine-Mile strain of *R. burneti* and one of the strains isolated by the authors. [See also this *Bulletin*, 1950, v. 47, 533.] *John W. D. Megaw*

DEUTSCH, D. L. & PETERSON, E. T. **Q Fever : Transmission from One Human Being to Others. Report of Three Cases.** *J. Amer. Med. Ass.* 1950, May 27, v. 143, No. 4, 348–50. [Refs. in footnotes.]

The authors describe three cases of Q fever in which the patients were attacked after attendance on a hospital patient suffering from the disease. The intervals between first contact with the patient and the onset were 23, 14, and 22 days. No other source of infection could be discovered. In each case the diagnosis was confirmed by the complement-fixation test.

Sera of 26 other persons who had been in contact with the original patient were examined for complement-fixing antibodies of *Rickettsia burneti* ; two of them gave positive reactions though no symptoms of the disease occurred.

The mode of transmission of infection could not be determined.

John W. D. Megaw

ZARAFONETIS, C. J. D. & BATES, R. C. **Q Fever : Report of a Case treated with Chloromycetin.** *Ann. Intern. Med.* 1950, May, v. 32, No. 5, 982–7, 2 figs. [10 refs.]

" A case of Q fever, developing 22 days after a single exposure, was treated with chloromycetin. An apparently favorable therapeutic result was achieved, and it is concluded that further trials of chloromycetin in Q fever are warranted."

Fouquet, J. & Morin, M. Fièvre boutonneuse contractée dans l'Ile-de-France et traitée par la chloromycétine. [**A Case of Boutonneuse Fever contracted in l'Ile-de-France.**] *Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1950, Nos. 1/2, 80–82.

The patient was infected in Ile-de-France during a shooting excursion. The vector was suspected to have been a tick.

The author mentions that boutonneuse fever has been reported from Lyons, Clermont-Ferrand, Toulouse and Arcachon, all of which are outside the recognized Mediterranean zone of endemicity in France.

The symptoms were typical, including the presence of a *tache noire*, a guinea-pig inoculated with blood taken on the 7th day gave no reaction. The Weil-Felix reaction, presumably with *Proteus OX19*, was positive at a titre of 1–20. Rickettsia-agglutination tests against various strains of rickettsiae were negative.

Chloromycetin was given from the 7th to the 10th day in daily doses of 3·0 gm., and there was a prompt response, the temperature falling to normal within 48 hours. *John W. D. Megaw*

Kostrzewski, J. **The Epidemiology of Trench Fever.** *Bull. Internat. Acad. Polonaise des Sci. et des Lettres.* Cracow. 1949, July–Dec. Nos. 7/10, 233–63, 7 figs. [46 refs.]

This paper contains a very useful review of the literature of trench fever and a description of the author's own investigations. Written in clear and impeccable English it forms an excellent introduction to the study of the disease.

The author cannot discover any reason for regarding *Rickettsia pediculi* or *R. weigli* as being essentially different from *R. quintana*: the supposed differences can readily be explained as variations in virulence.

The only reliable method of diagnosis is the isolation of the organism from laboratory-bred lice, infected by biting the patient or by intrarectal inoculation with the patient's blood.

Among the numerous persons engaged in the breeding and feeding of lice in the Polish laboratories as many as 30 per cent. have been found to be carriers of infection. Some workers appear to have an inherited immunity and to escape infection even after being bitten repeatedly by infected lice.

Details are given of the methods employed by the author in carrying out complement-fixation and rickettsia-agglutination tests; it is claimed that these give valuable information, but the author admits that they are not available except in specialized laboratories.

Although epidemics of trench fever have not been reported in peacetime conditions the disease is known to be endemic in certain regions, such as Volhynia, the Ukraine and Bessarabia, where carriers of infection are known to be numerous although the disease is seldom recognized. Apparently the communities concerned have become immune through childhood infection.
John W. D. Megaw

YELLOW FEVER

Pozzo, A. A. Fiebre amarilla. [**Yellow Fever.**] 95 pp. 1950. Buenos Aires: Ministerio de Salud Publica de la Nación.

This is a succinct general account of yellow fever published with a view to bringing up to date a work issued in 1944, in order that practitioners may be on

the look-out for cases of this disease and not be caught unawares, especially when they are confronted with an early case, so that the danger may be dealt with before infection has had time to spread and initiate an epidemic. The work is divided into 13 chapters, brief introductory remarks and a bibliography. With two exceptions, those on the virus and on prophylaxis, the chapters are very short and are mainly taken up with references to the literature. The author writes in turn on the history of yellow fever in the Argentine Republic, on the virus itself (including the exploded ideas of the *Leptospira icteroides* of Noguchi, Kuczinski's *Bacillus hepatodystrophicans*, and the *Treponema xanthogenes*), the symptoms and clinical forms, laboratory examination of the urine, blood and cerebrospinal fluid, the differential diagnosis from malaria, Weil's disease, dengue, typhus and typhoid fevers, smallpox and poisoning by carbon tetrachloride. A couple of pages on prognosis follow, with lists of good and bad indications. Biological investigations including serum-protection tests, fixation of complement and the reduction of complement procedure of da Costa Cruz [this *Bulletin*, 1929, v. 26, 1003 ; 1930, v. 27, 478, 868], precipitin reactions and intradermo-reactions with emulsions of the brain of infected rats ; the last is regarded by the author as " very promising and useful in estimating the degree of immunity in persons vaccinated against yellow fever." The pathological anatomy is disposed of in 3½ short pages and the treatment in two pages. Prophylaxis is more adequately dealt with, from the aspects of the patient himself, viscerotomy specimens, the mosquitoes and the use of larvicides, and the vaccination of non-immune persons.

A fairly extensive bibliography of 89 references ends the work, but many mentioned in the text are not included in this list and only two are dated later than 1944. This small book should prove useful to the general practitioner little acquainted with the disease, since it sums up the main facts, but it contains nothing with which readers of the *Tropical Diseases Bulletin* are not familiar. *H. Harold Scott*

RABIES

Brooks, A. G., d'Silva, C. B., Lahiri, B. N. & Ahuja, M. L. **Studies on Rabies.** *Indian J. Med. Res.* 1950, Jan., v. 38, No. 1, 119–23.

Kaiser, M. & Puntigam, F. Ueber die Verbreitung und Bekämpfung der Tollwut in den Donaustaaten. [**The Spread and Prevention of Rabies in the Danube States.**] *Wien. klin. Woch.* 1949, Aug. 5, v. 61, No. 31, 481–4.

This is a summary report of a Danubian Rabies Conference held in Budapest in December 1948.

Bulgaria reported an average of 2,000 animals infected by rabies per annum. Large-scale destruction of stray dogs (172,000 in 1947) was initiated and a vaccination programme started in June 1948, according to which it is planned to vaccinate in five years the country's estimated dog population of 1,000,000. An average of 8,000 persons a year are now being vaccinated by Hempt's method.

Yugoslavia.—Much rabies is introduced by wolves from Rumania, very little from Hungary : 230,000 dogs were vaccinated in 1947 and 400,000 in 1948.

Austria. Western Austria is free from rabies. In Eastern Austria incidence is considerable among foxes but comparatively rare in domestic animals. Bites of human beings have increased considerably. In 1948, 1,289 persons were bitten ; of these 990 received anti-rabies treatment.

CZECHOSLOVAKIA. Considerable increase in rabies is reported, mainly among foxes. Dogs inside a 30 km. zone surrounding infected districts were vaccinated.

HUNGARY. Since 1934 vaccination against rabies has been obligatory for all sheep dogs and since 1939 for all dogs. Between 1942 and 1944 there were no cases of rabies, but the disease reappeared when, owing to war conditions, vaccinations had come to a standstill. Recommencement of dog vaccination in 1947 has already reduced the number of cases very considerably. The vaccine was developed by Aujeszky and Kertay. It is an attenuated phenolized and glycerinated vaccine. A Hungarian strain, fixed by Högyes, is employed for its preparation. An estimated total of 7,000,000 dogs has been vaccinated, with an incidence of side reactions of 0·2 per mille. *C. Klimt*

BARSKI, G. & MAURIN, J. Inclusions négriformes en culture de tissu nerveux en l'absence du virus rabique. [**The Occurrence of Inclusion Bodies of the Negri Body Type in Nervous Tissue Cultures in the Absence of Rabies Virus.**] *Ann. Inst. Pasteur.* 1950, Mar., v. 78, No. 3, 411–14, 1 fig. [10 refs.]

The authors made a new approach to the problem of the specificity and composition of Negri bodies.

The brains of 15-day-old mouse embryos were cultivated in the liquid from coagulated chick plasma, plus extract of 10-to 12-day-old chick embryos, plus Tyrode solution.

Inclusion bodies appeared in infected cultures from the sixth day onward, but they also appeared in non-infected tissue culture controls.

Conditions of formation of these inclusion bodies were found to be dependent on a satisfactory growth taking place in the culture medium. They were found even when heterologous corpuscular elements were eliminated by centrifuging the chick embryo extract, a finding which, in the opinion of the authors, excludes phagocytosis of these elements as the mechanism of origin of the inclusion bodies.

Inclusion bodies could not be detected in similar cultures of chick embryo brain nor when mouse or rabbit plasma was used as a medium instead of chick plasma.

The inclusions are described as being of varying size but never larger than the nucleus, as occurring in numbers of one up to a few per cell, and as being of round or oval shape and well delineated. They are generally homogeneous, but occasionally show granular structure. They stain sometimes acidophilic and sometimes basophilic. As they stain with haemalum-eosin their behaviour is not identical with that of Negri bodies, but with regard to their other properties they resemble them closely.

The authors, basing their opinion on the appearance of identical inclusions in non-infected cultures, doubt the specificity of inclusion bodies in general and ascribe them to a non-specific cell reaction. [It seems to the abstracter that the authors have not proved the relationship between the inclusions described and the Negri body, and should therefore not generalize on the non-specificity of such formations.] *C. Klimt*

GRYCZ, E. Konserwacja ustalonego zarazka wscieklizny w glicerynie i w stanie wysuszonym. [**The Preservation of the Fixed Virus of Rabies in Glycerol and in a Dried State.**] *Ann. Univ. Mariae Curie-Skłodowska.* Lublin. 1949, v. 4, Sect. DD, 49–58. [17 refs.] English summary.

The authors compare the keeping qualities of rabies fixed virus in 50 per cent. glycerol and in the dried state. The results confirm the superiority of the latter, which fact is well known and has led to routine employment in virus laboratories all over the world. *C. Klimt*

WIŚNIOWSKI, J. Zastosowanie streptomycyny i penicyliny w rozpoznawczym szczepieniu bialych myszy na wściekliznę. [**The Use of Streptomycin and Penicillin in the Diagnostic Vaccination of White Mice for Rabies.**] *Ann. Univ. Mariae Curie-Skłodowska.* Lublin. 1950, v. 5, Sect. DD, 71–94. [14 refs.] English summary.

The authors recommend the addition of 1,000 microgrammes of streptomycin and 1,600 units of penicillin per ml. of a 10 per cent. contaminated brain suspension used for diagnostic purposes. [This method is used as a routine in large areas of the world and is already recommended in the latest textbooks. The intracerebral inoculation of a 10 per cent. brain tissue suspension into mice does not seem to be advisable because of the high fatality of this procedure.]

C. Klimt

FENDALL, N. R. E. **Two Cases of Hydrophobia.** *East African Med. J.* 1950, Apr., v. 27, No. 4, 167–72.

The author discusses briefly the incidence of rabies in animals in Kenya and refers to two proved human cases which had occurred in his district (Kitui) in 1945, of which he is, however, unable to trace records.

He now reports two more human cases in Kitui, both acquired from [presumably] rabid dogs. The first was that of an elderly man who had been bitten on the forearm two days before by a dog described as mad. He was given six daily anti-rabic injections, after which he absconded without completing the course. He returned about five weeks later (39 days from the day of the bite), with clinically established hydrophobia and died four days later. The diagnosis was confirmed in brain specimens at the Veterinary Laboratory, Kabete. The second case was that of a child with a similar history, but the bite had taken place about 4 weeks previously. In addition to the bite on the forearm, she was also bitten on the face. When she was seen, clinical hydrophobia had begun to develop and she died 4 days after admission to hospital. She had received no prophylactic vaccine. Negri bodies were not found in the specimen of hippocampus submitted, but the histological picture was characteristic of that found in a viral condition. In both cases, nervous manifestations and true hydrophobia were prominent. The case histories are discussed in detail and the author refers to the literature concerning prevention of rabies, which has been extensively noted in this *Bulletin.*

He adds that in 59 cases of dog-bite seen in his hospital during the year, anti-rabic vaccine was given in 58 ; no cases of hydrophobia resulted and no nervous sequelae were seen. [Unfortunately, unequivocal laboratory confirmation was not available in the second case.] *H. J. O'D. Burke-Gaffney*

TENBROECK, C. **A Test for the Antigenicity of Rabies Vaccine.** *Proc. Soc. Exper. Biol. & Med.* 1950, Feb., v. 73, No. 2, 297–301.

The proposed test consists of one intraperitoneal injection of 1 cc. of each of a series of vaccine dilutions ranging usually between 0·2 and 0·008 per cent. into guineapigs, to be challenged 3 weeks later by a dose of 0·5 cc. of a 20 per cent. street virus injected into the gastrocnemius muscle. The minimum amount of vaccine that will protect against a given dose of street virus is determined. A satisfactory vaccine is one which protects all the animals with 1 cc. of a 0·2 per cent. suspension and at least 50 per cent. with 1 cc. of a 0·04 per cent. suspension. After the challenge the guineapigs are observed for four weeks. The majority of those which develop rabies are dead by the 20th day.

The author considers this test to be more logical and less time-consuming than the generally applied potency mouse-test of Habel. He claims a mortality of 90 per cent. for the controls. [This test, although closely resembling natural conditions, has still some disadvantages, *viz.*, its duration of seven weeks ; the comparatively small range of 25-fold vaccine dilutions in which it is carried out ; and its not having 100 per cent. mortality in the controls.]

C. Klimt

LeBell, I., DeBoer, C. J., Hazz, Edna K. & Cox, H. R. **Complement-Fixing and Neutralizing Antibody Studies on Humans Vaccinated against Rabies.** *Proc. Soc. Exper. Biol. & Med.* 1950, Feb., v. 73, No. 2, 225–8. [16 refs.]

This interesting paper is devoted to a comparative study of neutralizing and complement fixing antibodies in human beings vaccinated against rabies.

The first series, comprising 17 persons treated for 7 days with 2 cc. of a 5 per cent. Semple-type vaccine, showed detectable antibody rise of both types one week after completion of treatment. The maximum was reached in 4 to 5 weeks. Thereafter neutralizing antibodies tended to persist almost unchanged up to 10 months when the last test was carried out, while complement fixing antibodies were completely absent from the 4th month on.

The second series, comprising 66 persons treated for 14 days, showed a higher rise in both kinds of antibodies on completion of treatment, when compared with the levels obtained one week after treatment in the previous series. Complement fixing antibodies reached their maximum 1 week after treatment. A sharp drop occurred after 4 months, while low titres could be detected up to the end of the 10-months testing period. The neutralizing antibodies reached their maximum slightly later, *i.e.* between the 4th and 5th week, and then remained at a fairly high level up to the end of the testing period.

The third series comprised 4 persons who had received anti-rabies treatment within 6 to 24 months previously. Neutralizing antibodies were present in all 4, the titre being inversely proportional to the time interval which had elapsed since the last treatment. The " booster " effect was clearly reflected in the levels of both kinds of antibodies, which far exceeded anything obtained in the two previous series.

The neutralization tests were carried out with undiluted serum of patients against equal amounts of virus dilutions, which were injected intracerebrally into mice after 2 hours' incubation at 37°C.

In the complement fixation tests, infected mouse brain, extracted with benzene from the dried state, was used as antigen and fixation was permitted to take place in the icebox overnight.

In the discussion, attention is drawn to the results of other workers, who could separate neutralizing from complement fixing antibodies by ultracentrifuging. The latter remained unchanged in the supernatant in which virus could no longer be demonstrated.

The authors emphasize that they do not intend to imply any correlation between the level or even the appearance of these antibodies and the actual degree of immunity.

C. Klimt

Lipton, M. M. & Freund, J. **The Formation of Complement Fixing and Neutralizing Antibodies after the Injection of Inactivated Rabies Virus with Adjuvants.** *J. Immunology.* 1950, Apr., v. 64, No. 4, 297–303.

Single injection of ultraviolet-irradiated vaccine suspended in paraffin oil, followed at monthly intervals by three booster injections of plain vaccine,

resulted in high complement fixing and neutralizing antibody titres in guinea-pigs and rabbits, particularly in the latter.

The addition of killed *Myco. butyricum* to the oil-suspended vaccine induced lethal allergic encephalitis in most animals. In the survivors it produced high anti-brain as well as specific antibody levels.

The results obtained tend to confirm a numerical relationship between complement fixing and neutralizing antibody titres in the range of 1 : 4 to 1 : 16. [It seems regrettable that the immunized animals were not challenged, thus permitting a study of the relationship between the antibody titres and the actual degree of immunity.] *C. Klimt*

KOPROWSKI, H. & BLACK, J. **Studies on Chick-Embryo Adapted Rabies Virus. II. Pathogenicity for Dogs and Use of Egg-Adapted Strains for Vaccination Purposes.** *J. Immunology*. 1950, Mar., v. 64, No. 3, 185–96. [16 refs.]

Intracerebral injection of dogs with the Flury strain adapted to chick embryo caused paralytic rabies in only 9 out of 25 animals, while with the egg-adapted NIH and NYC strains the results were 5 out of 5 and 3 out of 4 respectively.

Intramuscular injections of 20 to 40 per cent. chick-embryo suspensions infected with the Flury strain tried on a total of 7,500 dogs in no instance occasioned onset of the disease itself or of any serious clinical symptoms.

Immunity studies showed that only 2 of 76 dogs vaccinated with one injection of 5 cc. of a 20 per cent. chick-embryo suspension suffered from rabies after intramuscular challenge with street virus 3 to 27 weeks later. In the control group 32 out of 46 dogs contracted rabies. The two failures both occurred in the group vaccinated with the highest passage material, which also showed the lowest LD^{50} titre in mice.

When compared with egg vaccines prepared from NYC and Novisad strains, the Flury vaccine gave by far the best results, although its infectivity for mice was considerably below that obtained with the two other strains.

[This important paper reopens the case for dog and perhaps human vaccination with a live vaccine. The Flury vaccine will certainly be free of the paralysis-producing factor, keeps well in the dried state, and may prove to confer higher and more lasting immunity than has hitherto been obtained by single injection methods.] *C. Klimt*

PLAGUE

REYNES, V. Sur une souche atypique de bacille pesteux. [**An Atypical Strain of Plague Bacillus.**] *Ann. Inst. Pasteur*. 1950, Feb., v. 78, No. 2, 288–90.

The strain described was isolated from a European patient infected at Laos ; the cultures were made from the blood and from pus found in the infected glands.

The organisms failed to grow in the usual media, even when ascitic fluid was added, but only in blood media ; they were lethal to mice, guineapigs, rabbits, and fowls ; none of the animals was protected by anti-plague serum. The organisms grew as rapidly at 37°C. as at 28°C., and liquid media showed a homogeneous opacity. Full details are given of the other cultural characteristics of the organisms.

The patient's serum agglutinated the bacilli at a titre of 1–200 but failed to agglutinate *P. pestis*. The cultures gradually became adapted to ordinary media. The strain was kept without being subcultured from July, 1943, till

February, 1947, when it was sent to the Pasteur Institute (Paris), where it was found to have acquired the typical characteristics of *P. pestis*.

In the discussion of the paper Dr. G. GIRARD, under whose direction the culture was studied in 1947, said the organism at that time was undoubtedly *P. pestis*, but he doubted whether *P. pestis* could have shown the features described by the author. He suggested that there had originally been two strains ; a pneumococcus and *P. pestis*, the former having been most in evidence at the outset, but having died out leaving the latter free to show its typical characters.

He said that a similar association between these two organisms had been responsible for the classical misapprehension by Kitasato, whose original description applied to an organism quite different from the true Yersin's bacillus (*P. pestis*). [See also this *Bulletin*, 1947, v. 44, 520].

John W. D. Megaw

P'AN, H. S., TCHAN, Y. T. & POCHON, J. Étude cytologique de *P. pestis* soumis à l'influence du bactériophage spécifique. II. Étude de la cellule par la méthode de Robinow au violet cristal. [**The Cytological Changes produced in *Pasteurella pestis* by Specific Bacteriophage. II. A Study of the Cell when stained by Robinow's Method.**] *Ann. Inst. Pasteur.* 1950, Feb., v. 78, No. 2, 291–2, 2 figs.

The authors had already found that bacteriophage caused a distortion of *Pasteurella pestis* [this *Bulletin*, 1949, v. 46, 1029]. In the present investigation they employed Robinow's method of staining, applied to films made from cultures treated by bacteriophage.

The method consists in fixing by Bouin's fluid, treatment by a tanning mordant, and staining by crystal violet.

The chief feature observed was the presence of intracellular granules which were regarded as abnormal bodies whose formation was greatly accelerated by the action of bacteriophage. The appearance of the granules is shown by a photomicrograph.

John W. D. Megaw

LINK, V. B. **Plague Epizootic in Cottontail Rabbits.** *Pub. Health Rep.* Wash. 1950, May 26, v. 65, No. 21, 696.

A hunter from Maljamar, Lea County, New Mexico, developed bubonic plague within a week of having shot and cleaned six cottontail rabbits some two miles from his home.

A plague survey of Lea County was then undertaken by the Western Communicable Disease Centre Laboratory. During this survey 308 wild animals were obtained and 394 fleas and 202 ticks taken from them. Many cottontail rabbits and pack rats were found dead and tissue and fleas from two specimens of each were proved to be infected with plague. Positive results were also obtained in fleas from other pack rats and their nests and from grasshopper mice, but no plague was found in domestic rats. Fleas were absent from 32 rats trapped in Maljamar.

It is surmised that the patient (who recovered after treatment with streptomycin and sulphadiazine) had been infected from cottontail rabbits. Hitherto, rabbits were not believed to be subject to epizootics of plague. In 15 years, the Laboratory has examined 3,693 fleas from 431 cottontail rabbits and 873 fleas from 337 jack rabbits : two pools of fleas from cottontail rabbits and the tissue of one which was found dead were positive for plague : the jack rabbits were all negative.

These findings alter the previous view that cottontail rabbits were not too great a hazard for man ; and health authorities in counties with known active foci of plague should warn hunters of the danger of handling rabbits.

H. J. O'D. Burke-Gaffney

NICHOLSON, H. P. & VETTER, M. H. **A Lethal Trap for capturing Small Mammals with their Ectoparasites.** *J. Parasitology.* 1950, June, v. 36, No. 3, 235–7, 1 fig.

"A lethal gas trap employing hydrogen cyanide gas as the killing agent is described. Construction details are given. This trap has been used successfully to obtain information concerning the abundance of ectoparasites on roving small animals. Performance data under field conditions are presented."

CHOLERA

SINGH, G., MALIK, K. S., LAHIRI, M. N. & AHUJA, M. L. **Immuno-Chemical Studies of *Vibrio cholerae*. Part II.** *Indian J. Med. Res.* 1950, Jan., v. 38, No. 1, 125–9.

In continuation of a preliminary note on experimental immunization with extracted polysaccharide of *V. cholerae* [see this *Bulletin*, 1949, v. 46, 827] further results are now reported on the immunizing efficiency, the precipitin titres obtained, and the nitrogen content of the fractions.

The method of extraction employed was phenol treatment of a growth of *V. cholerae* dried with acetone and subsequent precipitation with 95 per cent. alcohol. Mice were given two doses of 0·2 ml. at weekly intervals followed by a challenge dose of mucinized suspension of the vibrio intraperitoneally a week later. The fractions were prepared from four Ogawa and five Inaba strains, and the immunizing doses employed, at two different levels, were approximately 0·004 mgm. and 0·0008 mgm.

The degree of protection obtained was considerable, but somewhat less than with the dosage of cholera vaccine used for control tests. The precipitin titres obtained against homologous strains varied from 1 in 200,000 to 1 in 2,000,000. The nitrogen content of the fractions was from 5·9 to 15·6 per cent. A fraction previously found to confer a high degree of immunity showed marked deterioration on storage over P_2O_5 for ten months.

Growth of a rough variant of an Inaba strain of *V. cholerae* in a medium to which the polysaccharide fraction of a smooth Inaba strain had been added failed to produce change to smooth type after 20 passages. Similar experiments with added suspensions of the vibrio disintegrated by freezing and thawing also gave negative results. With rough strains, prepared by growth in media containing antiserum, changes had, however, sometimes been noted after frequent passages on nutrient agar. Colonies were observed which reacted to as much as 25 to 50 per cent. of the titre of either Ogawa or Inaba type-specific sera. The pure rough form could, however, continue to be maintained by colony selection.

J. Taylor

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS

BEAVER, P. C. & DESCHAMPS, G. *Endamoeba histolytica* **and other Intestinal Parasites in Eastern Venezuela.** *Med. Bull.* New Jersey. 1950, Apr., v. 10, No. 2, 212–17.

Near Caripito, Venezuela, is a modern industrial town having largely a population of several thousand indigenous labourers employed by an oil company. The climate is tropical and the present study was made in the first four weeks of the rainy season (May) of 1947. The population live under conditions of good, controlled sanitation, but there are outside contacts with more primitive conditions.

Fresh stools were examined from (1) specimens received in the hospital laboratory and (2) those obtained in a survey of school children. They were examined by means of (1) unstained and, where necessary, stained smears, (2) zinc sulphate floatation and (3) in the case of *Entamoeba histolytica*, culture on Balamuth's medium.

The results are shown in a table and another table compares the results of direct smears with those of the flotation method.

The principal findings included : *E. histolytica*, 17 per cent. ; *Giardia*, 15 per cent. ; *Strongyloides*, 15 per cent. ; *Necator*, 31 per cent. ; *Trichuris*, 73 per cent. ; *Ascaris*, 43 per cent. Only 8 per cent. were free of any parasites. Except in the case of *E. histolytica* and *Ascaris*, zinc sulphate concentration tended to increase the smear findings. [This statement does not appear to be borne out by the figures in the relevant table, in the form in which they are presented.] Hookworm infections were more common in adults and *Ascaris* and *Trichuris* infections were heavier in children. It is suggested that direct " dooryard " pollution by children is of special importance in the spread of intestinal parasites in this community.

The authors note that despite its good sanitary conditions, the Caripito community showed infestation rates with *Ascaris*, *Trichuris* and protozoa comparable with those found in " unsanitated communities " under the same climatic conditions. This is borne out by reference to the findings of other workers in climatically comparable parts of South and Central America.

H. J. O'D. Burke-Gaffney

BEAVER, P. C. & DESCHAMPS, G. *Endamoeba histolytica* **in Talara, Peru.** *Med. Bull.* New Jersey. 1950, Apr., v. 10, No. 2, 218–25.

In continuation of their studies on the control of amoebic infection from the consumption of uncooked foods [this *Bulletin*, 1949, v. 46, 830] the authors discuss the results of stool examination in Talara, Peru. A survey was made of food-handlers at the public market, the hospital and the club. The persons examined were 155 vendors at the market and 52 food-handlers from the hospital and the clubs. In the first group *Entamoeba histolytica* was found in 31·6 per cent. and in the second in 17·3 per cent. Other pathogenic protozoa varied between 6 and 20 per cent. The incidence of worm infections was strikingly low, amounting in the two groups collectively to one hookworm, eight whipworms, three *Taenia* and five *Hymenolepis*. Detailed findings for each group are shown in a table.

It is noted that 34 per cent. of the vegetable handlers and 45 per cent. of the prepared food-handlers at the market were carriers of *E. histolytica* : five of the nine positives in the second group were hospital helpers who served meals to patients, three worked in a club kitchen and the ninth was a club waiter.

Reports from the Talara hospital laboratory showed that the incidence of *E. histolytica* among nationals has been only slightly less over the years than

the authors' findings for the public market group : between 1937 and 1946, the incidence has been between 15 and 30 per cent., with a sharp drop in 1941–43. Among foreign employees the incidence was 16 per cent. in 1937, less than 6 per cent. between 1939 and 1943, and about 13 per cent. since then. These figures are given in full in a table.

Since 1937, food-handlers in Talara have been employed only when a stool examination has been negative for *E. histolytica*. During employment, semi-annual stool examinations are required. A table shows the details of these examinations and the numbers of food-handlers found to be carrying *E. histolytica* together with the number of times they continued to be positive. Of 292 such persons, 151 had been positive at least once and 47 were positive more than half the number of times on which they were examined. Those found positive are barred from work until stool examination has demonstrated successful treatment.

The authors feel that since the incidence of amoebiasis in foreign employees has scarcely decreased in ten years, the control programme cannot be accomplishing its purpose well. It is however, noteworthy that the incidence of carriers among food-handlers employed in institutions is only about half of that occurring among the general population from which they are derived and with whom they have frequent contact. The conditions at the market itself and the quality of its products, appear to be good.

Reference is made to the more vigorous programme described by SCHOENLEBER in Aruba (an island off Venezuela) [this *Bulletin*, 1940, v. 37, 727]. This worker was able to reduce the incidence of *E. histolytica* among foreign employees from 25 per cent. in 1935 to less than 2 per cent. in 1938 by means of a rigorous four-point programme. *H. J. O'D. Burke-Gaffney*

EARLE, K. V. **Gastrointestinal Parasitic Infestation among Food-Handlers in Ecuador.** *Med. Bull.* New Jersey. 1950, Apr., v. 10, No. 2, 208–11.

The author examined the stools of 61 male and 48 female food-handlers in Ecuador : two groups were studied, namely those in Guayaquil and those in the field. They included cooks, waiters and butchers. The methods of examination are not stated.

The results are shown in three tables. Over 90 per cent. of the stools examined contained protozoan or helminthic parasites and some 75 per cent. showed multiple infections, up to as many as six types of parasite. Separate figures are given for men and women.

Entamoeba histolytica was found in 56 per cent. of cases, *Trichomonas* in 21 per cent., and other pathogenic protozoa in less than 2 per cent. *Trichuris* was found in 60 per cent., hookworm in 38, *Ascaris* in 29, *Strongyloides* in 21 per cent. and others in less than 1 per cent.

The results are compared in a table with those of other workers in Ecuador and in Peru and Argentina. It is evident that the incidence of parasitic infection was higher in Ecuador than in similar groups studied in Peru and Argentina and the author concludes that the problem of control of food-handlers is therefore correspondingly more important in Ecuador. *H. J. O'D. Burke-Gaffney*

RUYSENAARS, Alberdena. **A Non-Fermentable Solid Medium for the Cultivation of *Endamoeba histolytica*.** *Texas Reports on Biol. & Med.* 1950, v. 8, No. 1, 55–65, 3 figs. [11 refs.]

Among the media for cultivation of *Entamoeba histolytica*, the Difco Bacto liver infusion agar overlaid with serum-saline mixture is widely used in the U.S.A. One of its drawbacks is the presence of a substance fermentable by

the accompanying bacteria, which leads to gas-bubbling that splits the medium and permits the amoebae to drop out of reach. In the present study an attempt was made to eliminate this defect by pre-fermenting the medium. For this purpose tests were made with two media prepared from dehydrated Difco liver infusion agar, the fermentable substances of which had previously been removed, in one case by a yeast, in the other by *Bact. coli*. Growth of *Entamoeba histolytica* in these media was compared with that in the non-fermented medium, used as control. The results of the tests—which are described in great detail—were as follows. In the medium pre-fermented with yeast, gas formation was completely eliminated in a quarter, and in the *Bact. coli* media in a half of the tubes, while in the remaining tubes there was 85 and 90 per cent. reduction respectively. The small amounts of gas in the pre-fermented media did not disturb the slant surface, nor interfere with normal growth of the amoebae. Pre-fermentation of the medium increases the number of amoebae available for subinoculation and increases the chances of detecting the parasites in the routine diagnosis of amoebiasis by cultivation of faecal specimens. *C. A. Hoare*

HANSEN, E. L. **A Liquid Medium composed of Dehydrated Ingredients for Culture of *Endamoeba histolytica* associated with a Single Bacterium.** *J. Lab. & Clin. Med.* 1950, Feb., v. 35, No. 2, 308–12. [18 refs.]

The author describes a new liquid medium composed of standardized dry constituents, with rice as the only solid matter. In this medium *Entamoeba histolytica* has been maintained continuously together with a single species of bacterium. It has been used successfully for testing amoebicidal properties of drugs, for large-scale production of amoebae and their cysts, and for physiological studies.

The composition of the medium is as follows (in grammes per 100 ml. of medium : (1) proteose-peptone (Difco No. B.120) 2·0, (2) liver enzymatic digest (Wilson's fraction L) 0·3, (3) *l*-cysteine hydrochloride 0·1, (4) methionine 0·02, (5) cholesterol 0·004, (6) rice powder (Difco No. B.146), 0·4, (7) NaCl 0·5, (8) $Na_2HPO_4.7H_2O$ 1·0. (9) KH_2PO_4 0·1.

It is prepared as follows. The last three ingredients, (7, 8, 9) are dissolved in the concentrations indicated to form a stock solution which is kept in lots of 4 litres. When required, the medium is prepared in amounts of 500 ml., by dissolving the other constituents in the stock solution in the following order : first (1–4) are added and dissolved (with shaking) in ten minutes, then (5) is dispersed by mild agitation, while (6) is added separately to the test tubes, each of which contains 4·5 ml. of medium. Sterilization is effected by autoclaving for ten minutes at 123°C. under 15 lb. pressure. Rice powder is sterilized thrice with dry heat at 100°C. for one hour, and 5 mgm. are added to each tube.

The author gives a brief characterization of each of the above constituents and the part they play in promoting the growth of amoebae.

In this medium the number of amoebae per tube rose to 500,000 in 48 hours, starting from an inoculum of 150,000 contained in 0·5 ml. of the parent culture. This amount was also employed in inoculating subcultures used for amoebicidal tests. The test compound was added immediately afterwards and the results were determined 48 hours later. In this manner more than 300 chemicals were tested, their effectiveness being compared with that of emetine hydrochloride, in which the range of amoebicidal activity was from 1 : 100,000 to 1 : 400,000.

C. A. Hoare

GRIFFIN, A. M. & MCCARTEN, W. G. **Sterols and Fatty Acids in the Nutrition of Entozoic Amoebae in Cultures.** *Proc. Soc. Exper. Biol. & Med.* 1949, Dec., v. 72, No. 3, 645–8.

Using the LSB medium described by them previously for the cultivation of *Entamoeba histolytica* [this *Bulletin*, 1949, v. 46, 829], the authors attempted to replace the serum normally present in the medium by cholesterol, but, having failed to produce satisfactory results, they subjected the serum to fractionation and studied the growth of the amoebae in the different fractions. The serum proteins were precipitated by adding five volumes of ethyl alcohol at 0°C., after which the precipitate was washed in alcohol and acetone, then dissolved in M/30 phosphate buffer in 0·4 per cent. NaCl at *p*H 7·2 and finally brought to the original volume (Fraction *A*). Fraction *B* was obtained by evaporating the pooled filtrates to dryness and extracting the residue with absolute alcohol: the extract was then reduced in volume to 10 ml. and added to a buffered NaCl solution equal in volume to that of the original serum. The alcohol was removed by boiling and the original volume was restored with distilled water. Fraction *C* was prepared by extracting the alcohol-insoluble residue with acetone and making an emulsion as above. The three fractions were added to the liver-infusion base of LSB medium in proportions corresponding to 10, 5 and 1 per cent. of whole serum, and the resulting media were sterilized.

All the media were inoculated with *E. histolytica*, and the cultures—kept at 37°C.—were examined and subinoculated at intervals of 48 hours, with the following results: with *A* growth succeeded for four generations, while with *C* it was less satisfactory, but *B* was capable of supporting growth indefinitely. As the results indicated that steroid or phospho-lipid components of serum were essential growth-factors, an analysis was made of the LSB medium, which revealed the presence of cholesterol in the basic liver infusion, and of cholesterol and its esters in the completed medium. Therefore *E. histolytica* was cultivated in LSB medium in which serum was substituted by cholesterol oleate or palmitate (0·15 mgm. per ml.). The results were comparable to those in the original medium.

The authors next tested the individual effects of the components of the medium, by cultivating *E. terrapinae*—the growth requirements of which are similar to those of the human parasite—with cholesterol oleate, cholesterol, oleic acid and a mixture of the last two. While the first two components gave good growth, oleic acid alone or together with cholesterol inhibited growth of the amoebae, suggesting some toxic action. However, a quantitative study of this question showed that oleic acid at an optimum concentration (0·02 mgm. per ml.) stimulated growth by reinforcing the action of cholesterol. It was found that cholesterol oleate can be used as a supplement in liver infusion medium, provided it is hydrolysed to its constitutent molecules, since otherwise it is not available to the amoebae. *C. A. Hoare*

SADUN, E. H., CARRERA, G. M., KRUPP, Iris M. & ALLAIN, Dorothy S. **Effect of Single Inocula of *Endamoeba histolytica* Trophozoites on Guinea Pigs.** *Proc. Soc. Exper. Biol. & Med.* 1950, Mar., v. 73, No. 3, 362–6.

It has recently been shown that guineapigs are highly susceptible to infection with *Entamoeba histolytica* [this *Bulletin*, 1950, v. 47, 465]. In the present paper the authors describe the results of a quantitative study of the host-parasite relations in experimental amoebiasis of the guineapig. The animals were inoculated intracerebrally with amoebae derived from 48-hour cultures, which were pooled, centrifuged, and diluted to produce inocula with the

desired number of amoebae, as determined by counting a sample in a haemocytometer chamber. The guineapigs were divided into ten groups, in nine of which the animals received inocula containing amoebae in progressively increasing numbers ranging from 100 to 5,000,000, while in one group they received cultures in which the amoebae were killed by freezing with the view to testing the effect of the concomitant bacteria upon these hosts. While no changes were produced in animals of the latter group, in the others the results were as follows. Guineapigs inoculated with less than 1,000 amoebae did not become infected, the dose producing 50 per cent. infections in a group being 10,000 amoebae. It was found that the average weight of the susceptible animals was significantly smaller than that of the resistant ones. Out of 50 guineapigs inoculated with 5,000 to 5,000,000 amoebae, 31 died as the result of infection in five to 17 days after inoculation (average 9·3 days). The dose of amoebae inoculated proved to be inversely related to the duration of the infection. The results of *post mortem* examination were confirmed by histopathological studies, showing that all the infected animals had typical amoebic lesions, while in none of the controls or negative animals were any ulcers seen.

C. A. Hoare

Basnuevo, J. G. & Gutiérrez Estarlí, E. Absceso hepatico amibiano, gigante. [**Giant Amoebic Liver Abscess.**] *Rev. Kuba Med. Trop. y Parasit.* 1949, Nov.–Dec., v. 5, Nos. 11/12, 144–7, 2 figs. [10 refs.]

The English summary appended to the paper is as follows :—

" The authors present a case of giant amoebic liver abscess which reached them in an extremely advanced stage.

" A tremendous amount of amoebic pus was extracted through surgery.

" It was possible to administer only 1 gram of Chloroquine since, due to its seriousness, the patient died before any more of this drug could be administered.

" In other cases of amoebic liver abscess the authors have obtained very good results with Chloroquine at the following dosage :

" Chloroquine, 0·01 gram (sal) per pound of body weight up to 100 pounds, daily, for 3 days.

" After that 0·01 gram (sal) per pound of body weight up to 50 pounds, daily for 24 days."

Basnuevo, J. G. & Valdés Larralde, L. Absceso hepatico ambiano curado con Tanakán (Cloroquina). [**Amoebic Liver Abscess cured with Tanakán (Chloroquine).**] *Rev. Kuba Med. Trop. y Parasit.* 1949, Nov.–Dec., v. 5, Nos. 11/12, 156–8, 2 figs. [23 refs.] English summary.

Basnuevo, J. G. & Vázquez Rosales, G. Un nuevo caso de absceso hepatico amibiano curado con cloroquina. [**A New Case of Amoebic Liver Abscess cured with Chloroquine.**] *Rev. Kuba Med. Trop. y Parasit.* 1949, Nov.–Dec., v. 5, Nos. 11/12, 149–53, 4 figs. [23 refs.] English summary.

Kempski, H. " Pan-Colon-Klysma "—eine neue Einlaufmethode und ihre Bedeutung für die Tropenpraxis. [**High Enema in the Treatment of Tropical Disease.**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1950, Apr., v. 1, No. 4, 575–86. [14 refs.]

Under the imposing name of Pan-Colon-Klysma the author recommends a high enema for irrigation of the colon. As much as two litres are administered and the patient turns first on the left side, then to the prone position, then to the right and finally lies on his back and retains the enema (if he can) for 12

hours. The process may be assisted by mild massage. The author claims to have used this treatment during the past seven years in some 2,500 cases of amoebiasis, dysentery and helminthic infestations with good results [but no figures are given]. *H. Harold Scott*

RELAPSING FEVER AND OTHER SPIROCHAETOSES

Diaz Marin, J. & Irigoyen Ramirez, A. I. Algunos aspectos en la inoculación experimental de la fiebre recurrente. [**Experimentally Inoculated Relapsing Fever.**] *Med. Colonial.* Madrid. 1950, Apr. 1, v. 15, No. 4, 307–22, 4 figs. [36 refs.]

From a study carried out by the authors in an outbreak of relapsing fever in Morocco in 1945–46 they found a spirochaete differing from *Spirochaeta hispanica* but possessing the pathogenicity of *S. recurrentis*. They are of the opinion that it is a variant or mutation of *S. hispanica* and they think that this mutation has come about through passage in another arthropod, probably the flea. By means of a very clear diagram they indicate that the tick-borne

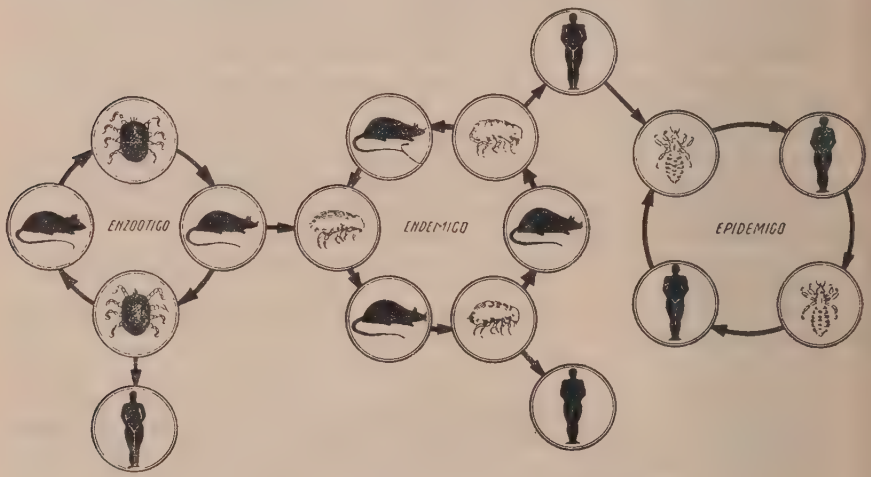


Diagram illustrating the transition of the tick-borne enzootic form of relapsing fever through a flea-borne endemic form to a louse-borne epidemic form in man.

[Reproduced from *La Medicina Colonial.*]

enzootic form may infect man and the rat ; the endemic form infecting the rat flea and so man, and from him the louse, causing the epidemic form in man.

H. Harold Scott

Forteza Bover, J., Garrigues Orellana, A. & Marco Orts, F. Fiebre recurrente cosmopolita en Valencia. [**Louse-borne Relapsing Fever in Valencia.**] *Rev. Sanidad e Hig. Pública.* Madrid. 1949, Jan., v. 23, No. 1, 3–25, 18 figs. (10 on 5 pls.). [18 refs.]

An outbreak of relapsing fever occurred in Valencia in the autumn of 1947. Notes are given of 15 patients ; in seven, spirochaetes were seen in the blood,

in eight they were not found and the diagnosis was made on clinical grounds. The infecting spirochaete was expected to be *Sp. hispanica*, which is carried by *Ornithodorus erraticus*, but none gave a history of being bitten by ticks, while louse infestation was very common. The cases occurred in the winter months and all showed fever with one or two relapses, enlargement of spleen and liver, severe headaches with slight jaundice as the fever subsided. There are good illustrations of the blood with spirochaetes and a photograph of a gipsy encampment where all seven members of one family were attacked. This is said by the authors to be the first record of louse-borne relapsing fever in Spain.

H. Harold Scott

Gimeno de Sande, A. Brote epidémico de fiebre recurrente cosmopolita en Motril. [**An Outbreak of Louse-borne Relapsing Fever in Motril.**] *Rev. Sanidad e Hig. Pública.* Madrid. 1949, Sept., v. 23, No. 9, 694–704. [28 refs.]

Motril is on the south coast of the Province of Granada. In May, 1948, a case was reported from Salobreña, a few miles west of Motril, as typhus fever, but the history was of a few days' fever, then an apyrexial period, followed by another attack of fever. Examination of the blood in thick drop revealed spirochaetes in large numbers. The patient was a gipsy ; no ticks could be found in her hut. In June the same year blood was sent from another patient, also from Salobreña, for examination for suspected malaria and again large numbers of spirochaetes were seen ; others came from November onwards and altogether the spirochaetes were found in the blood of 28 patients while 19 others, judged by their clinical histories, had suffered from the same disease. Of those with positive blood findings, four were under two years of age, four between five and 14 years ; 18 were above this age [these total 26, not 28] ; of those unconfirmed by blood examination, three were under two years, six between five and 14, and ten were over 15 years.

In *Spirochaeta hispanica* infections relapses are usually multiple ; in the form seen in Motril most had only two febrile periods, a few had three, none had more. The author had no difficulty in finding the spirochaetes in the Giemsa-stained fluid exuding from lice crushed between two slides.

H. Harold Scott

Ravina, A., Pêcher, Y. & Avril, J. Typhus récurrent contracté à Paris. [**Relapsing Fever contracted in Paris.**] *Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1950, Nos. 11/12, 508–10.

A Paris housewife of 54 suffered for a few days from fever and was then admitted to hospital with a sharp pyrexial attack. She was in a typhoid state, prostrated, but without signs of meningitis. There was a conjunctival subicterus and a slight tenderness of the liver, but no neurological signs, albuminuria or skin rash. A blood culture was taken, but unfortunately became contaminated.

Treatment with sulphonamides and penicillin was given and the condition regressed completely in 48 hours. A week later it recurred in exactly the same form. Another blood culture was taken and on the sixth day of incubation the authors observed a slight disturbance of the upper layer on the red cell sediment. A smear was taken from this layer and was found to be full of spirochaetes. Attempts to cultivate them were unsuccessful and they disappeared in a few days.

Blood examinations showed a slight reduction in red cells and haemoglobin : no spirochaetes were found in smears.

The patient had been born in Greece and lived there and in Egypt and Italy for the greater part of her life : but she had now been permanently resident in Paris for many years. It transpired, however, that her son, aged 14, had been a refugee in the Greek mountains where he had lived under very poor hygienic conditions. He had been brought to France two months previously, in a bad condition and heavily infested with lice. He admitted several attacks of " high fever " of short duration in recent months. No spirochaetes were found in his blood : guineapig inoculation was not done.

The patient made a complete recovery after intensive penicillin treatment (one million units daily for 12 days). During an unimportant and light febrile attack, her blood was proved to be negative both by direct examination and by guineapig inoculation.

The authors consider that this was undoubtedly a case of louse-borne relapsing fever and that it was transmitted by an infested person coming from an endemic area. They note the unusual circumstances of having detected large numbers of spirochaetes in the sediment of a blood culture and suggest that they sometimes may vegetate there without multiplying. The question arises as to how long blood infected with spirochaetes will retain its infectivity when maintained outside the body : this point, the authors suggest, has some practical bearing in relation to blood transfusion. *H. J. O'D. Burke-Gaffney*

WALTON, G. A. **Relapsing Fever in the Meru District of Kenya.** *East African Med. J.* 1950, Feb., v. 27, No. 2, 94–8.

An account is given of a detailed enquiry into the complicated relationship between the distribution of relapsing fever and the distribution of the tick *Ornithodorus moubata* in the Jombeni moutain area of the Meru district of Kenya.

Where the people use separate huts for sleeping and for storage, the bed consists of a solid mud platform with the head end against the wall and the foot end near the fire in the middle of the hut. Ticks occur in the soft soil at the foot of the bed near the fire. In the other type of hut the bed is made of slats of wood raised off the ground and in these huts the ticks live in the soil under the bed, or around the posts nearest to the fire. Sometimes neighbouring huts were seen which were entirely free of ticks. Obviously, then, some factor or factors exist which prevent the ticks establishing themselves in certain huts. In an attempt to discover the reason for this uneven distribution, 264 huts in an infested area were examined and compared with 100 huts in an area free from ticks. Records were made of the presence or absence of ticks ; the method of hut and bed construction ; atmospheric conditions both inside and outside the huts ; the conditions of the microclimate of the tick's habitat and the presence or absence of domestic animals in the huts.

From this enquiry it seems probable that while in general the conditions in the Jombeni mountains are unfavourable to ticks, their presence is encouraged inside the huts with mud beds. It would also appear that while abolition of this type of bed would reduce the tick population it would be a slow process during which the people would lose their immunity and bring about a situation difficult to explain to them.

The author believes that this difficulty could be overcome by the wholesale application of Gammexane at the same time as the attempt to alter the habits of the people in regard to their methods of hut and bed construction.

H. S. Leeson

ARUWA, W. A. K. **A Case of Relapsing Fever in a Child of Nine Days Old.** *East African Med. J.* 1950, Apr., v. 27, No. 4, 176–7.

Rao, K. N. A. & Kalra, S. L. **Tick-borne Relapsing Fever in Kashmir.** *Indian J. Med. Res.* 1949, Oct., v. 37, No. 4, 385–94. [10 refs.]

This outbreak of tick-borne relapsing fever was first reported in February 1948, in Jammu province, and subsequently other cases have been found in Kashmir. Although the presence of the disease had been suspected for some time, these are the first definite cases to be recorded.

Three species of ticks were found in the locality, *Ornithodorus crossi*, *O. lahorensis* and *Argas persicus*, but the last would feed only on fowls. *O. crossi* was found universally distributed and had a definite association with cattle, sheep and goats, and was found in houses and huts where these animals had been quartered. These ticks readily fed on laboratory animals. Fourteen batches were fed on guineapigs, of which 8 became infected, with spirochaetes in the blood after incubation periods of 5 to 12 days. The febrile period lasted 1 to 4 days and there were usually 2 or 3 relapses at intervals of 3 to 5 days. Six animals were infected by inoculation with blood from a human patient and showed incubation periods of 3 to 8 days. Normally none of the guineapigs succumbed to the infection, but the virulence was enhanced by successive passages, and during the 5th and 6th passages some animals died.

White rats were similarly infected, also white mice and one monkey (*Macaca radiata*). A goat inoculated with heavily infected blood showed no signs of infection.

The natural mode of infection was considered to be by the bites of infected *O. crossi*. *O. lahorensis* although widely distributed never produced infection and spirochaetes were not found in its tissues. Attempts to transmit the disease by means of lice gave uniformly negative results.

The disease seems to be universally distributed over the provinces of Jammu and Kashmir, excluding Ladakh Valley and cases occurred in rural areas as well as towns, including Srinagar and Baramula. The incidence is highest in the summer months when ticks are more active. *E. Hindle*

Narain, S. & Kalra, S. L. **Streptomycin in Tick-borne Relapsing Fever of Kashmir.** *Indian Med. Gaz.* 1950, Mar., v. 85, No. 3, 87–8.

In Kashmir the authors have noted that 97 per cent. of cases of tick-borne relapsing fever were cured by arsenical treatment ; those which did not respond were resistant to penicillin also. They therefore tried the use of streptomycin on 18 cases. These were typical of the disease as seen in Kashmir and the clinical features are described briefly.

The paroxysm usually lasted for 1 to 7 days and the relapses were at intervals of 1 to 14 days, commonly 2 to 4. Complications such as iritis, pneumonia, haemorrhages, nervous sequelae, rashes and secondary anaemia were not seen and are not indeed features of the disease as seen in Kashmir. None of 650 patients seen have died and the authors state that the disease is milder than the louse-borne relapsing fever of India : in severity it approaches the Persian rather than the Central African type.

In 15 of the 18 cases under review, parasites were seen in the peripheral blood : in one of the others, they appeared after an injection of 0·5 cc. of adrenaline and in the other two they were detected by inoculation of white rats.

All 18 patients were given 1 gm. of streptomycin daily in two divided doses at intervals of 3 to 4 hours for two consecutive days only. The treatment began in 3 cases after the first paroxysm, in 3 after the first relapse, in 6 after the second, 3 after the third, 1 after the fifth and 2 after the sixth relapse. The results were equally good in all cases. In some cases, symptoms were markedly aggravated after the first injection, but after the second there was improvement.

When the full 2 gm. had been given symptoms disappeared within a week. There were no relapses during the observation period of 1 to 2 months and no untoward symptoms attributable to the drug.

The authors point out that while in most cases the Kashmir strain of the spirochaete is not resistant to arsenic, the use of streptomycin cured two patients in this series who did not respond to the former drug. Also the high incidence of arsenical encephalopathy which has occurred in Indian troops treated for syphilis with trivalent organic arsenicals suggests that a safer substitute is to be desired (although they have not noted this complication in the treatment of relapsing fever with arsenic).

The authors suggest in conclusion that streptomycin will have its use in arsenic-resistant cases of relapsing fever or in those in which arsenic is contra-indicated for any reason. *H. J. O'D. Burke-Gaffney*

Knowles, F. A. & Terry, E. D. **Prevention of Tick-borne Relapsing Fever.** *East African Med. J.* 1950, Feb., v. 27, No. 2, 88–93.

At Morogoro township and district in Tanganyika a large scale scheme of eradication of the tick *Ornithodorus moubata* by gammexane was carried out during 1947 and 1948.

A survey showed that the ticks were not confined to one part of the town or to one type of house and that the presence of fowls encouraged them. For the disinfestation of the houses in the township the insecticide used was D220, or Agrocide 7, which contains 2·5 per cent. gammexane ; one part of this was mixed with four parts of diatomite to produce a very fine light powder which was easily distributed. This powder, locally known as " G dust," was applied by a trained staff at the rate of 3 lb. per 1,000 square feet at a total cost of two shillings for each premises for one full-scale treatment. Repeated checks showed that the tick population fell to negligible proportions. In the first year of the scheme one full and one half-dosage treatment cost much less than the hospital treatment of the average number of cases of tick-borne relapsing fever during 1944–1946.

The results on the sisal and other estates, though good, were not so striking as those obtained in the township. A different form of gammexane was used, DO34, or Agrocide 3, which has a gamma content of 0·5 per cent. ; it was applied without admixture by casual labour at a dosage of two pounds per 1,000 square feet, and most camps received from two to four treatments in twelve months. The camps were more liable to reinfestation than the township

The effect of the eradication scheme on the incidence of relapsing fever is well shown in the following table :

Relapsing Fever Cases diagnosed at Morogoro Hospital : (Blood slide positive : Spirochaeta duttoni).

Year	Township	Estates	Combined	Yearly total	Deaths
1944				127	4
1945	(Not differentiated)			219	2
1946				137	3
1947 Jan.–June ...			167	271	7
1947 June–Dec. ...	16	80	96		
1948 Jan.–June ...	1	28	29	45	nil
1948 June–Dec. ...	3	13	16		
1949 Jan.–June ...	1	6	7	7	nil

The work showed that regular treatment of the houses with gammexane by a trained staff achieved comparative freedom from *Ornithodorus moubata* and as a result the almost complete elimination of tick-borne relapsing fever at less expense than it had taken previously to treat the patients in hospital.

H. S. Leeson

LEPROSY

Cordero Soroa, A. La lucha contra la lepra en España. Censo de enfermos y censo de convivientes. Un año de lucha antileprosa. [**The Campaign against Leprosy in Spain. Census of Patients and Contacts. One Year of the Campaign.**] *Rev. Sanidad e Hig. Pública.* Madrid. 1949, Apr., v. 23, No. 4, 356–76, 2 figs. on pl.

Prior to the Civil war, says the author, no Government in Spain paid any attention to leprosy. Either they did not know of it, or they regarded it as unimportant as existing only in rural districts and among the poorest, or it may be that other, more political, matters distracted their attention. The establishment of a leprosarium in Granada was suggested, but the neighbours objected and the project came to nothing. Then, with a view to isolating " dangerous cases " a sanatorium was established in Fontilles and four in the provinces, with a total of 200 beds. Then in 1942 the Balneario de Trillo, in Guadalajara Province, was taken over for a National Leprological Institute as a centre and was opened in 1943 with 90 patients, and little by little more pavilions were added to accommodate 300, men and women, visualizing 1,000 when everything had been completed. Two other leprosaria were to be set up, one in Orense and one at Abona, in Teneriffe.

For early diagnosis and treatment instruction was given at the School of Dermatology and the National School of Hygiene. The next stage was to obtain a census of leprosy patients and 1,510 were discovered, 885 males and 625 females, and 1,619 families for contacts comprising 6,344 persons. Details of the disposal of 1,508 are given ; 603 were interned in leprosaria, 33 were in provincial hospitals, 380 were receiving help in their homes, 427 were under no control (*evadidos y sin control sanitario*), 47 died during the year and 18 were on parole. The various provinces from which the patients came are stated, but this information is not of general interest.

At the present time there are 7 leprosaria, 91 dermatological dispensaries and 63 secondary centres where patients are seen. The question of the children of leprous patients is to come under consideration. There are 4 mobile units, in the Provinces of Jaén, Valencia, Málaga and Pontevedra which call on contacts in order to detect cases in an early stage. By a Decree of March, 1948, there is organization for protection of the patients and for regulating what work they can undertake. In an appendix are reproduced tables of the numbers, the sexes and the present disposal of patients in each of 52 provinces, and of the forms which have to be sent in with information of the patients, the contacts, the laboratory findings, etc. *H. Harold Scott*

Gehr, E. & Gehr, Elisabeth. Die Lepra in Ostasien. [**Leprosy in East Asia.**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1949, Dec., v. 1, No. 3, 303–27, 3 figs. [146 refs.]

This paper is itself a summary with 146 references going back to 1878. It deals with the known incidence of leprosy in Eastern Asia from Japan in the

north to Siam and Indo-China in the south. An outline map of the whole area shows leprosy rates of over 1 per mille in the Southern Islands of Japan, Korea, Shantung and western and southern China and Siam. Areas with under 1 per mille include the rest of Japan, east-central China, Tonking and Annam. A more detailed map of south-east Asia is also given. The article will be useful for reference purposes. *L. Rogers*

André-Thomas, Chaussinand, R. & de Ajuriaguerra, J. A propos du diagnostic clinique de la lèpre ; la valeur de l'aréflexie pilomotrice en aires. [**Clinical Diagnosis of Leprosy and the Diagnostic Value of the Absence of Pilomotor Reflex.**] *Bull. Acad. Nat. Méd.* 1950, v. 134, Nos. 1/2, 11–17.

This is a detailed clinical description of the diagnostic features of a case of leprosy, which was verified by finding lepra bacilli in the nasal mucous membrane. Symptoms due to affection of the sympathetic as well as the systemic nerves are emphasized, for the details of which the paper should be read by those interested. *L. Rogers*

Smith, M. **A Pharmacological Study of Three Sulphones. Part III. The Specific Toxic Phenomena.** *Leprosy Review.* 1950, Jan.–Apr., v. 21, No. 1, 17–29.

This further paper contains chemical details on which the following conclusions are based. The anaemia resulting from haemolysis due to sulphones is not greater with daily oral doses of diaminodiphenylsulphone not exceeding 0·3 gm. than after sulphetrone and the cost is only one-tenth of that of the proprietary sulphones. Owing to its being better absorbed and slowly excreted diaminodiphenylsulphone is preferable and data in this paper show that it is not detrimental to the liver or renal functions, but in known cases of kidney dysfunction the dose should not exceed 0·1 gm. daily. The author also advises the parenteral use of sulphetrone on account of its poor absorption when given orally. Diaminodiphenylsulphone in the oral dose advised did not accumulate in the blood so its control by blood estimations is unnecessary. Further clinical studies of the dosage of sulphones is advised. [See also this *Bulletin*, 1950, v. 47, 372, 474.] *L. Rogers*

Relwicz, A. L. **Some Experiments with Injected Sulphetrone.** *Leprosy Review.* 1950, Jan.–Apr., v. 21, No. 1, 30–34.

This brief paper gives tables of the blood level of sulphetrone after injection of 20 and 33 per cent. solutions in 13 patients and shows that the latter strength is necessary in a daily dose of 5 cc., but the author advises injections every other day of the same dose to avoid the strain of daily injections.
L. Rogers

Simpson, I. A. & Molesworth, B. D. **The Fate of Injected 4 : 4′Diaminodiphenylsulphone in Humans and Guinea Pigs.** *Leprosy Review.* 1950, Jan.–Apr., v. 21, No. 1, 5–16, 2 figs.

The authors have estimated the blood levels of 4 : 4'diaminodiphenylsulphone during clinical trials in the treatment of leprosy. For this purpose a reaction depending on the coupling of the diazotized sulphone with N-(1-naphthyl)-ethylene diamine to give a purplish red colour was used. The estimation of the drug in tissues and urine caused some difficulty since, after

extraction, the colour obtained by the above reaction had a somewhat pink tinge. The weighed tissue was first ground with sand in the presence of N.HCl and then filtered after standing in the cold. An aliquot of the filtrate was mixed with HCl and trichloracetic acid and the colour was developed in the clear solution obtained on filtration. Comparison was made in a photo-electric colorimeter with standards similarly treated, and a reagent blank for setting the instrument at zero was included. Determinations in urine were similarly made after suitable dilution. The absorption curves of the various solutions at approximately the same concentrations were determined. It was found that there was a slight shift in the region of maximum absorption in these colours developed from tissue extracts, but no explanation of the fact was forthcoming, since the tissues of untreated cases gave negative results and the drug was obtained chemically pure and unconjugated from urines. Assuming that the slight changes in absorption indicated were of little significance for estimation, the distribution of the drug in the tissues of a few guineapigs and human patients was determined. In both hosts, the highest concentrations were found in liver and kidney, reaching in man a level of 6–7 mgm. per 100 gm. of tissue. *J. D. Fulton*

HELMINTHIASIS

Lie Kian Joe & Bras, G. Enkele bijzondere worminfecties uit Indonesië. a. Plagiorchis javensis. b. Ancylostoma caninum. c. Het syndroom van Meyers en Kouwenaar : hypereosinophilie en microfilarien in de lymfeklier. [**Some Worm Infestations from Indonesia. a.** *P. javensis.* **b.** *A. caninum.* **c. Hypereosinophilia and Microfilariae in the Lymph Glands.**] *Med. Maandblad.* Batavia. 1950, May 1, v. 3, No. 5, 165–73, 5 figs. on pl. [15 refs.]

The English summaries appended to the paper are as follows :—

(a) " Infection with *Plagiorchis javensis* was demonstrated in two patients of a lunatic asylum, who died of dysentery and primary carcinoma of the liver respectively and were autopsied. In either case one specimen was found.

" A description of both worms is presented.

(b) " A finding of one female *A. caninum* in the bowel contents of an Indonesian woman is reported. It is stressed that this is the only case among several hundreds of autopsies in which the intestinal helminths were examined minutely.

(c) " From over 500 biopsies of lymphglands examined in Djakarta during a period of 4 years (1946–1950) five were obtained from patients showing the clinical syndrome of general lymphadenopathy and blood hypereosinophilia, combined with hypereosinophilia in the lymphglands. Four of these glands showed eosinophilic abscesses and or tuberculoid structures, in some of which parasites were seen, presumably microfilaria. This entity was first described by Meyers and Kouwenaar (1939).

" Owing to a mental disability one patient stayed in hospital and could be observed clinically, for nearly two years. The adenopathy as well as the blood eosinophilia have gradually disappeared and as yet none of the more common manifestations of filariasis (lymphostasis) have developed.

" In none of these patients were microfilaria demonstrated in the peripheral blood.

" An additional case of hypereosinophilia of the blood in which tentatively the diagnosis of tropical eosinophilia was made by the clinician, showed an

altogether different histological picture in the excised lymphgland. Thus stressing the fact that the others probably belong to a separate entity.

" Additional clinical and pathological evidence is needed to get more light on this very interesting but puzzling syndrome."

VOGEL, H. Immunologie der Helminthiasen. [**The Immunology of Helminth Infections.**] *Zent. f. Bakt.* I. Abt. Orig. 1949, Aug. 25, v. 154, Nos. 3/5, Bericht pp. 118*–26*.

This is a useful general account of this subject, but it has no bibliography. Most of the work discussed has been abstracted in this *Bulletin* and most of it is discussed in books on the subject. The author discusses :—

(1) *In vitro* serological work and skin reactions done to detect antibodies and their use for diagnosis. He refers, in the course of this discussion, to his own work with the cercariae of *Schistosoma mansoni* and *S. japonicum* [this *Bulletin*, 1949, v. 46, 1154].

(2) The more recent studies of immunization. This complex subject is more fully discussed and it is impossible in a short space to record adequately the author's account of it. The paper itself, or such textbooks as Culbertson's *Immunology of Parasitic Infections*, should be consulted. *G. Lapage*

HITCHCOCK, Dorothy J. **Parasitological Study on the Eskimos in the Bethel Area of Alaska.** *J. Parasitology.* 1950, June, v. 36, No. 3, 232–4.

" 1. The incidence of the intestinal protozoa in the Eskimos of the Bethel area is similar to that of the general population in the northern United States.

" 2. *Diphyllobothrium* sp. was observed in 15% of the population examined.

" 3. *Enterobius vermicularis* occurred in 58% of the people, being most common in the age group 21–70 years.

" 4. Mixed intestinal parasite infections occurred in 39% of the people.

" 5. The intradermal trichina skin test showed 6·6% of the population to be reactors."

PANI, A. Sulla bilharziosi vescicale (studio di 114 casi). [**On 114 Cases of Infestation by** *Schistosoma haematobium.*] *Acta Med. Italica.* 1950, May, v. 5, No. 5, 133–8. [14 refs.] English summary.

This paper consists in the main of general remarks on *Schistosoma haematobium* infestation, illustrated by 114 cases under the author's observation. They were seen by him during a three years' residence in the Libyan Sahara. Of the total, 88 were males between four and 25 years of age and 26 were children between six and 15 years ; none of the females affected was above childhood age. Of 90 whose blood was examined, eosinophilia was present in 86, absent in four ; in 60 of the 86, faecal examination was carried out and in 52 of them *Ascaris* ova were found ; the author argues, therefore, that in eight only of the 90 could the eosinophilia be ascribed definitely to the schistosome. Several of the patients presented no symptoms indicative of schistosome invasion and this he attributes, hypothetically, to " attenuation of the cercariae " or to some degree of immunity on the part of the subject.

The fact that females affected were only among the children he accounts for by a possible keratosis of the skin of the adult rendering penetration difficult, or, again, to acquired immunity. For treatment he is in favour of antimony tartrate in high doses and preferably intravenously, with adrenaline to avoid intolerance. *H. Harold Scott*

Bueding, E. & Koletsky, S. **Content and Distribution of Glycogen in *Schistosoma mansoni*.** *Proc. Soc. Exper. Biol. & Med.* 1950, Apr., v. 73, No. 4, 594–6.

" From 13·6 to 29·0% of the dry matter of the males of *S. mansoni* consisted of glycogen. In females the amount varied between 2·7 and 5·0%.

" The glycogen in both male and female worms was deposited principally in the musculature and parenchyma. The relatively small amount in the female is explained by the less well-developed musculature and parenchyma and the more abundant sexual apparatus which is glycogen negative.

" Histological studies were in general accord with the quantitative observation that the amount of glycogen in the male tends to increase with age."

Rissel, E. & Hartmann, G. Ueber einen Fall von Clonorchiasis sinensis mit Gallengangskarzinom. [**On a Case of *Clonorchis sinensis* Infection with Carcinoma of the Bile Ducts.**] *Wien. klin. Woch.* 1949, June 10, v. 61, No. 23, 355–6, 1 fig.

Infection with the liver fluke [species not stated] is rare in the Vienna district and infection with *Opisthorchis* (*Clonorchis*) *sinensis* has not, so far as the authors know, been recorded. They describe the case of a woman, aged 52, who was infected with this species of fluke. She had left Vienna in 1938 to spend some years in Shanghai, returning to Vienna in 1947. In June 1948 she developed icterus with enlargement of the liver to one finger's breadth below the costal margin. The spleen was not enlarged, but there was an eosionphilia of 9 per cent. and acceleration of the blood sedimentation rate, which increased later to 90 mm. per hour. The temperature was at times sub-febrile. Later the icterus and enlargement of the liver increased and complete acholia developed. Operation revealed enlarged bile ducts and a cystic tumour the size of a walnut at the junction of the two hepatic ducts with papillomatous growth at its opening, which closed both hepatic ducts. The patient died and at autopsy specimens of *Opisthorchis* (*Clonorchis*) *sinensis* were found in the branches of the hepatic duct. The enlarged and thickened bile ducts and other post-mortem appearances are described. It is known that infection of the liver with this species of fluke may be associated with the formation of tumours, but it was not possible to decide whether the flukes found in the patient described played a part in the causation of the carcinoma of the bile ducts or not.

G. Lapage

Minning, W. & Vogel, H. Immunbiologische und epidemiologische Untersuchungen bei 3 Fällen von menschlicher Fasciolose. [**Immunological and Epidemiological Studies of Three Human Cases of *Fasciola* Infestation.**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1950, Apr., v. 1, No. 4, 532–53. [Numerous refs.]

The English summary appended to the paper is as follows :—

" Sera of three fasciola-infected children reacted positive in the complement-fixation test with an alcoholic extract of Fasciola. There was no definite relation between the intensity of clinical symptoms, eosinophilia of the blood, and the titre reached in the test. Positive reaction outlasted clinical cure and disappearance of parasites for six months. Seven sera of bilharziosis cases and two sera of Opisthorchis infections did not reach the titre of the two less positive-reacting fasciolosis sera. Group specificity for trematodes was not evident in the complement-fixation test when extract dilutions exceeding the titre reached by WaR-positive sera were tested. Sera of human cestode infections reacted

negative. Specific results were also obtained with fasciola extract in normal saline solution. While sera of fasciolosis reacted negative with bilharzia worm extracts, cercaria extracts of Bilharzia gave positive results. These were also obtained with extracts from digestive glands of snails infected with various indigenous trematodes. Two out of five cestode extracts gave doubtful or positive results.

" One child reacted positive in the skin reaction with fasciola antigen up to 1 : 100 000, the other two reached 1 : 10 000. There was no analogy between skin test and gravity of clinical symptoms. Six months after the end of treatment reactions were still positive. Skin tests with fasciola antigen were positive also in cases of bilharziosis ; and one case of fasciolosis reacted positive with bilharzia antigen. Two of our fasciolosis cases reacted negative with echinococcus antigen in the skin test.

" Two out of three Fasciola infections seen during the course of one year (they were children living in North Western Germany) were most probably due to the eating of fresh sorrel, while the third case could be traced to the eating of apples fallen into a water ditch. In the ditch Galba truncatula were found, ten per cent of which contained redias and cercarias of Fasciola hepatica. Fasciola eggs excreted by this child were tested for their faculty to develop into miracidia and compared in this respect with Fasciola eggs obtained from bovines. The latter formed six times more miracidia than the former."

DAVE, C. J. **Generalized Cysticercosis Cellulosae.** *Indian Med. Gaz.* 1950, Mar., v. 85, No. 3, 92–4, 5 figs. on pl. [17 refs.]

A case in Bombay.

HARANT, H. & FABREGAT. Un nouveau cas de taeniasis à *Dipylidium*. [**A New Case of *Dipylidium* Infestation.**] *Bull. Soc. Path. Exot.* 1950, v. 43, Nos. 3–4, 157.

Human infestation by *Dipylidium caninum* is relatively rare and the authors state that according to GUIART only six cases have been reported in France, all in young children.

They then record the case of a girl of 2½ who had never left the Department of Hérault in the South of France and who had a history of passing two or three stools a day, without actual diarrhoea. In these stools were found a single segment " *qu'il a été facile d'identifier* ". The child showed an erythema of the buttock and itching of the back ; was pale but slept well and had a fair appetite.

In view of the age of the child a linctus of pumpkin seeds was the only treatment given : this resulted only in three glairy stools containing threadworms ; but a month later, similar treatment resulted in elimination of the parasite. Three months later a clinical examination showed the child to have been restored to health and no further passage of segments has been reported. [The only reference to the actual parasite is that quoted above : it is assumed that it was *D. caninum*.] *H. J. O'D. Burke-Gaffney*

RAY, H. N. **Echinococcal Cyst of Broad Ligament.** *Indian Med. Gaz.* 1950, Mar., v. 85, No. 3, 88–90, 3 figs. on 2 pls.

ASHLEY, W. F. **Surgical Echinococcus Disease.** [Thesis for Degree of M.Sc., Univ. of Minnesota.] 27 typewritten pp., 5 figs. [Bibliography.] 1948.

VACCARO, U. La prova della fenolftaleina nell'anchilostomiasi. **The Phenolphthalein Test in Ankylostomiasis.** *Acta Med. Italica.* 1950, Apr., v. 5, No. 4, 101–2. English summary (4 lines).

The phenolphthalein test is carried out as follows : 0·1 gm. of phenolphthalein dissolved in 10 gm. alcohol and diluted in 20 cc. of water is given to the patient fasting in the morning. He must not take either food or drink. His urine is examined after two and after four hours, immediately on being voided. NaOH, 10 per cent., is added drop by drop to the urine in a white porcelain capsule or a glass with a white card beneath it, until no further change occurs. A colour change to rose then red is regarded as positive and an indication of a mucosal lesion in the alimentary tract. In cases of cardiac disease, fever and nephropathies a similar reaction may be seen, but not until the lapse of six hours. The rationale of the test is that if the intestinal mucosa is intact this small amount of phenolphthalein is not demonstrable in the urine ; it is seen only if some lesion is present.

Of 13 patients so tested who had received treatment for their infestation the result was positive in three only and in all three the parasite was still present as shown by faecal examination. The author claims on rather a small number of cases] that a negative result indicates total elimination of the parasite. *H. Harold Scott*

LENTZE, F. A. Entwicklung, Epidemiologie und Bekämpfung der in Deutschland vorkommenden menschlichen Helminthiasen. **The Development, Epidemiology and Control of Human Helminthiasis occurring in Germany.**] *Zent. f. Bakt.* I. Abt. Orig. 1949, Aug. 25, v. 154, Nos. 3/5, Bericht pp. 75*–97*. [Numerous refs.]

The author divides the species of helminths discussed into those which require an intermediate host (Group A) and those which do not (Group B). In group A he considers *Fasciola hepatica, Dicrocoelium lanceolatum, Opisthorchis felineus, Taenia solium, T. saginata, Echinococcus granulosus, Diphyllobothrium latum* and *Trichinella spiralis* ; in group B he considers *Strongyloides stercoralis, Ancylostoma duodenale, Trichuris trichiura, Ascaris lumbricoides, Enterobius vermicularis* and *Hymenolepis nana*. Much of the information given during the discussion is in textbooks, but many interesting details are not. The extensive bibliography is valuable, but the dates of some items in it do not correspond with those given in the text.

Some species which formerly raised problems of public health in Germany no longer do so in that country ; among these are *Trichinella spiralis, Ancylostoma duodenale* and *Taenia solium*. The incidence of *T. saginata* is now declining. Hydatid cysts are rare in man, but there is considerable infection of dogs with *Echinococcus* in German sheep-rearing districts.

Ascaris lumbricoides and *Enterobius vermicularis* have, on the other hand, spread during recent years to such a degree that they are now a plague of the people in Germany, and the paper discusses these more fully. The author contrasts the epidemiology of these two species and, like other authors *cf.* BURLINGAME above and SCHLIEPER & KALIES below, he ascribes the spread of *A. lumbricoides* largely to the use of human faeces for gardens and other places where vegetables that are eaten raw, such as salad plants, radishes and strawberries, are grown. This practice sets up characteristic family infections with *Ascaris*, which are derived from the family garden. Infections are also caused by the use of sewage effluents for watering such vegetables as these. The author establishes his argument by figures of the incidence of *Ascaris*. Thus more people were infected in places where earth closets, rather than

sewage systems were used ; people with their own gardens were more often infected than people with no gardens ; and among those who manured their gardens with human faeces 63 per cent. were infected, while no Ascarids were found in people who used animal manure.

The author discusses measures of control that are based on the biology of the species considered. *G. Lapage*

BUSLINGAME P. L. Eine Methode zur Zählung von Askarideneiern. [**A Method for the Enumeration of *Ascaris* Eggs.**] *Zent. f. Bakt.* I. Abt. Orig. 1949, Aug. 25, v. 154, Nos. 3/5, Bericht pp. 116*–18*.

This paper describes the method of counting *Ascaris* eggs used for the investigation described below.

The author used thick films made by spreading human faeces over two-thirds of an ordinary slide. It was experimentally found that about 0·2 gm. of faeces was needed to make thus a thick film that was not too thick to be seen through and weighing of the amount of stool was not considered to be necessary. The films were fixed for five minutes in 95 per cent. alcohol to which a drop of eosin had been added to give it a rosy tint. The films were then dehydrated twice in absolute alcohol and cleared in xylol. When permanent preparations were needed, they were mounted in Canada balsam, but for routine examinations a few drops of xylol were run under the cover slip. The eggs of *Ascaris* and *Trichuris* look yellow to brown on a reddish background.

The author says that the method makes it possible to examine seven times as much stool as that examined in three preparations made by the Stoll dilution method or in "*Natronpräparaten*". He does not recommend flotation with zinc sulphate because this does not always float up *Ascaris* eggs, so that light or moderate infections may be missed.

The degree of infection is determined by the number of eggs in the film per microscopic field and this is related to the number of eggs per gramme as follows : 0·2 gm. of faeces were spread over 1,000 sq. mm., and there were 580 microscopic fields in this area, so that 1 gm. of faeces would cover 5,000 sq. mm. Thus there were 580 × 5=2,900 microscopic fields per gm. of stool. The number of *Ascaris* eggs per gm. of stool would be the number per microscopic field multiplied by 2,900. Experiment showed that counts of 25 microscopic fields gave useful average numbers of eggs per gramme.

The author makes what he calls "a very gross" estimate of the number of worms present from the number of eggs per gramme and the number of eggs produced by each female Ascarid, arriving at the conclusion that 58,000 eggs per gramme of stool represents about 100 ascarids. This comes within his category of a heavy infection. If such a stool is that of a child three years old, three-quarters of the total number of eggs must be subtracted, so that the number of worms would then be 25 and this number perhaps represents, in a child aged three years, just as heavy an infection as 100 would be in an adult. In a district such as Griesheim, however, where everybody swallows *Ascaris* eggs more or less regularly, there will be immature worms as well as the mature ones. A table indicates the author's categories of light, moderate, heavy and very heavy infections, and the numbers of *Ascaris* eggs per microscopic field and per gramme respectively. The author claims that, although the results given by this method were more variable than those obtained by him by Stoll's method, time and labour were saved and useful estimates of the incidence of *Ascaris* were obtained.

The method was discussed after the meeting at which this paper was delivered where ZSCHUCKE describes the modification of the Stoll method which

uses the apparatus made by Leitz and sold by Bergmann and Altmann, Berlin. With this apparatus the stool need not be weighed. A suspension of it is made volumetrically in a special flask and the counting is done in a special counting chamber, similar to the Burker leucocyte-counting chamber, which fills automatically by capillary action. Zschucke claims that this apparatus increases the accuracy by 33 per cent., shortens the time required to the same degree and requires only a low magnification. *G. Lapage*

BURLINGAME, P. L. Askariasis im Kreis Darmstadt. **Ascariasis in the Darmstadt District.** *Zent. f. Bakt.* I. Abt. Orig. 1949, Arag. 25 v. 154 Nos. 3–5 Bericht pp. 111*–16*, 2 figs.

This investigation [see also SCHLIEPER & KALIES below] was undertaken during February and March, 1947 to provide evidence of the urgent need for the import of anthelmintics to this area.

As the map illustrating the paper shows Griesheim is the centre of a small but very productive arable and vegetable-growing area which supplies the surrounding towns of Darmstadt, Frankfurt and Wiesbaden with vegetables. The vegetable plots are watered with sewage effluent from Darmstadt by a system which, as the map shows, is partly underground and partly in the form of open ditches. This practice dates back to 1882 and has since then made ideal arable land out of a naturally sandy and infertile soil.

The author studied the incidence of *Ascaris* in the population of the area by the method described above. Table I shows the incidence among children aged one to 15 in Darmstadt and in various villages around it. It shows that 84 per cent. of 147 043 children examined were infected. Table II divides the children into the categories of infection described in the preceding abstract. It shows that 39 per cent. of them had light infections of one to five worms, 28 per cent. had moderate infections of five to 25 worms, 13 per cent. had heavy infections of 25 to 100 worms, and 4 per cent. had very heavy infections of 100 to 350 worms. Figure 2 shows this graphically and also the relative urgency of treatment in the 12 different centres studied. In Griesheim, where, as the author states, everybody swallows *Ascaris* eggs more or less regularly, 99 per cent. of the children were infected and in Darmstadt 90 per cent. In Griesheim 36 per cent. of children had heavy infections and 18 per cent. very heavy ones, while in Darmstadt none of the infections was very heavy and only 6 per cent. were heavy. The author calculated that about 15 000 doses of anthelmintic were needed for each 30 000 children under 16, in order to reduce their infections to the light or negative categories and that these would be needed every six months. Table III describes the symptoms in each category.

Among 247 adults aged 16 to 70 years, 100 per cent. living in Griesheim and 70 per cent. living in Darmstadt were infected. Table V classifies all the results in age groups. It shows that, among 1 498 persons examined between the ages of one to 70, the percentage infections ranged from 84 in the age group one to five years and 63 in the age group 51 to 70 and that it never fell below 63 per cent.

Discussing the epidemiology, the author considers that the chief causes of these high degrees of infection are contact with infected soil and lack of anthelmintics, the stock of which was exhausted in 1946. Alteration of the system of irrigation would cost more than the provision of anthelmintics and would probably injure the agricultural productivity. Possibly another series of investigations done now would show a decline in the incidence due either to the import of anthelmintics by the American authorities in September

1947 or to climatic factors. The summer drought in 1947, for instance which ruined the vegetables in this area, probably also killed billions of *Ascaris* eggs.

G. Lapage

SCHLIEPER, C. & KALLES, W. [Quantitative Untersuchungen über die Spulwurmverseuchung der Bevölkerung im Landkreis Darmstadt. **Quantitative Investigations on *Ascaris* Infection of the Population of the Darmstadt Rural District.**] *Zeit. f. Hyg. I. Abt. Orig.* 1949 May 15, v. 154, No. 1, 78–86, 2 figs. [21 refs.]

Numerous studies done during the last ten years have shown that *Ascaris* infection of the German people has in comparison with the incidence of infection during the last century shown a relatively marked decrease. Table 1, taken from SCHLIEPER and UHL (in the Press) shows the incidence in adults and children in 23 districts in Germany since 1916 and records incidences ranging from 1 to 41 per cent. The work of ESCHBORN, SEIFAT and WEGAND (this *Bulletin*, 1932, v. 29, 404) showed that it is possible that post-war conditions and special hygienic factors have caused an increase in certain populations. In the villages of the Kurische Haff area they found that children aged three to 14 years were especially heavily infected. Since 1945 a considerable increase of the incidence has been associated with the decline of hygienic standards and other factors which favour the spread of *Ascaris* (see BÖNEKE, *Dent. med. Woch.* 1947, v. 72, 498 and DOERKSEN, *Med. Klin.* 1947, v. 42, 145). In middle Hessen, for instance in the Marburg area, the incidence was as usual low, but in Southern Hessen it has become higher since 1945. BÖNEKE (above) first discovered the extraordinarily high incidence in Darmstadt and especially in the neighbouring Griesheim district (see SCHLIEPER, *Bulletin of Hygiene*, 1950, v. 25, 495). In this area Schlieper and Kalles found the following incidence:—

Darmstadt city	52 ± 2 per cent. of	595 people.
Darmstadt rural district without Griesheim	39 ± 1 per cent. of	1,460 people.
Griesheim	90 ± 2 per cent. of	332 people.

At the same time there was a series of cases of severe disease caused by *Ascaris*. In the hospitals 180 cases were found and of these, 30 patients were dangerously ill and eight died. The work of Baumbigger (*loc. cit.*) and Reuter (Gesundheits-Ingenieur, 1948, v. 69, 85) left no doubt that an important cause of this state of affairs was the use of the Darmstadt sewage effluent containing an enormous number of *Ascaris* eggs for watering the Griesheim vegetable gardens and also in the opinion of Schlieper and Kalles, the manuring and top-dressing of these gardens with human faeces.

The earlier studies on the incidence in Germany, which the authors review, suggested that the numbers of actual worms present were low, but the severity of their effects observed in the Darmstadt area suggested that the worm burdens of individual people were abnormally high. The authors therefore investigated this.

Their method of counting the *Ascaris* eggs was the following modification of Stoll's dilution method:—

Into a thick, narrow vessel of 50 cc. capacity 3 gm. of stool were weighed and stirred with 20 cc. of 3 per cent. NaOH solution and a "small amount" of disinfectant. This mixture was left overnight at room temperature. Next morning 30 cc. of it were poured into a 50 cc. vessel and back again and the mixture was then aerated through a tube passing to the bottom of the vessel to get an even suspension. With a pipette 0·1 cc. was taken and placed upon a layer of three drops of glycerin spread on a slide. After some hours the water in this had evaporated and the firm particles had sunk into the glycerin and

were permeated by it. The preparation was then covered and counted. In 21 counts the authors found a median error of ±11 per cent. Usually only one slide was counted, a second being counted only in doubtful cases. The sources of error are discussed. For firm stools the counts were multiplied by Zschucke's factor 0·66 [this *Bulletin*, 1932, v. 29, 37] and for soft ones by 1·5. The authors consider that, in a series of counts, all the sources of error cancel out. To estimate the number of worms present the authors used Zschucke's estimate for German conditions, *i.e.*, 1,000 eggs per gm.=1 female *Ascaris* or 600 eggs per gm.=1 *Ascaris* [*cf.* the method used by Burlingame (above), in the same area].

The stools of 157 people in the Darmstadt rural area were examined. Of these 59 belonged to Griesheim, which has an incidence of 90 per cent. and 98 to the rest of this area, which has an incidence of 39 per cent. The number of worms estimated from the egg counts varied from one to 276. The number of worms in some individuals in Griesheim was extraordinarily high and endangered life. In Griesheim the incidence was abnormally high. It was estimated that in Griesheim each infected individual had 45 worms, a number of the order of that found in the tropics, while in the rest of the area each had 15, one-third of the number, but still high. The number of worms was higher among children aged one to 14 years than among adults, although the frequency of infection was about the same in both. In Griesheim, both the children and adults of families working the vegetable gardens had especially high numbers of worms. Adults of the farming families had relatively lower numbers of them (19±4 ascarids per person). Table 2, fig. 1, taken from Schlieper and Uhl, shows the results of egg counts done in 1943–4 in Griesheim, Darmstadt without Griesheim, and Nauheim. Fig. 2 shows graphically the relationships between the numbers of eggs, the numbers of worms and the percentage of infected persons. The authors warn the reader that the figures recorded are based on single smears of stools taken from a relatively small number of people.

Discussing control, the authors say that this should aim at reducing the numbers of eggs in the areas inhabited by man and at prevention of the entry of embryonated eggs (they require 30 to 40 days before they become embryonated and therefore infectious) into the human intestine. Factors needing attention are the proper disposal of human faeces, the use of these as manure and the irrigation of vegetable plots with the effluent of sewage works, the contamination of drinking water with embryonated eggs (which is exceptional nowadays but played a part in infection in Kiel in the past), the consumption of infected salads, radishes, strawberries, etc., and personal cleanliness, *e.g.*, the washing of hands dirtied by soil containing eggs. In Marburg the incidence of *Ascaris* infection is nowadays low, yet such post-war factors as defective living conditions, hygiene and nutrition are the same as in Darmstadt ; but the following two factors differentiate the latter town from the former :—

(1) The extensive growing in Griesheim of vegetables watered by sewage effluent and the large number of small gardens there. Gromatschewskij (*Odessaer med. Ztschr.*, 1930, 20–22 and 42–44) and other Russian workers found *Ascaris* in up to 100 per cent. of people living in the irrigation fields of Odessa, which are cultivated much as those in Griesheim are. While 40 per cent. of these were carriers of *Ascaris*, only 14 per cent. of the residents of Odessa were infected. [See also Vishnievskaya, this *Bulletin*, 1946, v. 43, 565, and Vasilkova, *ibid.*, 1945, v. 42, 569.]

(2) The extraordinary consumption of uncooked vegetables (salads, etc.) in the Darmstadt area, where salads are provided for each meal, while in Marburg relatively few uncooked vegetables are eaten.

The authors recommend the abolition of the use of sewage effluent for irrigation, the killing of *Ascaris* eggs in human manure by the heat generated

by maturing it or by chemical substances and the use of artificial manure. The people should be educated about the method of infection and about personal cleanliness and infected persons should be treated. Studies of the incidence should be made from year to year. *G. Lapage*

SCHMIDT, H. Zur Immunologie der Ascariden. [**On the Immunology of the Ascarids.**] *Zent. f. Bakt.* I. Abt. Orig. 1949, Aug. 25, v. 154, Nos. 3/5, Bericht pp. 139*–40*.

The author used, as an antigen for intracutaneous tests, not an extract of whole *Ascaris*, but the proteins, fats, lipoids and polysaccharides separated from it. He tested horses with preparations made from *Ascaris megalocephala* and found that they all gave positive reactions, while cattle did not. The reaction was positive even when careful search for Ascarid eggs was negative. A mare that gave a negative reaction to *Ascaris* protein had a foal that was also negative after birth. A strongly positive mare had a foal that was lightly positive immediately after birth. The author concludes that the "allergy" to *Ascaris* can be transmitted through the placenta. Tests done on horses with *Ascaris* polysaccharides were either negative or uselessly slight. The author's studies of the possible differentiations of *Ascaris lumbricoides* from man and the pig (*i.e.*, *Ascaris suis*), by means of intracutaneous tests, are incomplete, although they have so far included also Ascarids from horses. Tests done on children showed that children infected with *A. lumbricoides* reacted most strongly to the proteins of this species, but that they also reacted to the proteins of *A. megalocephala* and *A. suis*. With the protein of *A. suis* the reaction was always lighter than with the protein of *A. lumbricoides*, so that it is improbable that *A. lumbricoides* and *A. suis* are identical. It was remarkable that all the children who reacted strongly "with Ascarids", also gave positive reactions with protein from *Taenia saginata*. Work on this general subject is being continued at Marburg University, but it appears that a single *Ascaris* infection renders subsequent skin tests practically worthless.

Tests done with lipoids and fatty substances derived from *Ascaris* by a method similar to Moro's percutaneous tuberculin technique gave no reactions of diagnostic value.

The polysaccharide fractions were used for experiments related to those done by OLIVER GONZÁLEZ [this *Bulletin*, 1947, v. 44, 226 and 729] on their relationships to the human blood-group substances. The polysaccharide of pig *Ascaris* is able to bind human anti-A and anti-B-isoagglutinins and Schmidt found that the polysaccharide from the horse ascarid can also do this. He concludes that the specificity of these A and B substances is referable to the nitrogen-containing portion of the molecule and that the polysaccharide fraction is identical in the A and B substances. It has not yet been chemically differentiated. The author suggests a method of finding out how far this identity extends also to the O-substances. *G. Lapage*

JACOBSEN, A. K. F. Ascarider forårsagende aflukning af galdevejene, mekanisk ileus og diffus peritonitis hos et 3 års barn. [**Liver Injury, Obstruction of the Common Bile Duct and Intestine, and Generalized Peritonitis, caused by *Ascaris lumbricoides*.**] *Nordisk Med.* 1950, June 9, v. 43, No. 23, 957–8. [12 refs.]

The English summary appended to the paper is as follows :—

"A girl aged 3 suffered from repeated attacks of ascariasis for half a year. She was treated with an anthelmintic (santonin), with only transient improvement. She was admitted to hospital in extremely poor condition, with

symptoms of ileus and generalized peritonitis. On examination of the abdomen an oblong tumour was discovered on the right side, and the patient was immediately operated upon under the diagnosis of invagination causing ileus and peritonitis.

"Laparotomy revealed generalized peritonitis caused by the ascarides perforating the intestinal wall and by a complete intestinal obstruction of the jejunum. At jejunotomy 172 ascarides were extracted. In spite of transfusions and every suitable form of therapy the child died 7 hours after admission.

"Autopsy disclosed that the common bile duct was occluded and the liver perforated throughout by the ascarides having caused disseminated abscesses in and destruction of the tissue. Forty-nine ascarides were removed from the liver tissue and a further 94 from the intestinal canal.

"Some surgical aspects of ascariasis are briefly reviewed and X-ray examination is recommended."

Indian Research Fund Association. Rep. Scient. Advisory Board for Year 1948, 184–92. **Filariasis.**

Dr. A. K. Mukerji tested 33 compounds for their power to kill microfilariae (*bancrofti*) *in vitro* at 24–35°C. in about 16–30 hours. Among the most active compounds were the cyanine dye No. 863, M.4889 [it is not clear whether this is Proguanil or another derivative], M.3349, chloroquine, Miracil D, styrylquinoline 314, and certain isoamyloxyarsonic acids prepared by Professor Bhide.

At King Institute, Guindy, Madras, tests were made of a filarial skin antigen prepared from *Conispiculum guindiensis* [? a filarial worm which occurs in lizards]. The test was made by injecting intradermally 0·01 cc. of a 1 in 100,000 dilution of the antigen into 407 subjects. The resulting weal reached its maximum in 15 minutes in positive cases. A difference of at least 3 mm. with the control serum was taken as the criterion. Of 259 cases of clinical filariasis, 85·7 per cent. were positive (including all cases in which microfilariae were demonstrated); and of 114 control non-filarial cases, only 2·8 per cent. were positive. In some patients being treated with Hetrazan, a reaction which was initially positive changed to negative in 2–7 weeks. Various chemical investigations have been made by Dr. B. B. Dikshit and Dr. K. Venkataraman on the effect of attaching wetting agents to antifilarial drugs such as antimonials, cyanine dyes, and Hetrazan. *F. Hawking*

Hewitt, R., Kenney, M., Chan, A. & Mohamed, H. **Follow-up Observations on the Treatment of Bancroftian Filariasis with Hetrazan in British Guiana.** *Amer. J. Trop. Med.* 1950, Mar., v. 30, No. 2, 217–37, 1 fig. [11 refs.]

This paper reports further observations on patients previously described by Kenney & Hewitt [this *Bulletin*, 1949, v. 46, 654]. In the first group, 57 patients had been treated with doses of 0·1 to 1·1 mgm. per kgm. thrice daily for three weeks, the total dose being less than 50 mgm. per kgm. Forty-one of the patients were examined 8 months later; 15 (36 per cent.) were free from microfilariae and the microfilariae reached pre-treatment levels in only 2 of the others. Six patients had complained of symptoms due to filariasis after treatment. There was no obvious relation between the dosage and the tendency to relapse. It is recognized that all these doses had been too low.

At Georgetown, 216 patients had been treated with doses from 0·2 to 2·6 mgm. per kgm., the total dose being 13 to 193 mgm. per kgm. At the end of treatment 95·8 per cent. of 216 were negative for microfilariae ; after six months, 71 per cent. of 135 were negative, after 10 months 65 per cent. of 124 were negative and after 14 months 64 per cent. of 83 were negative. Most of the new recurrences happened between the 3rd and 7th months, no new ones occurring after the 11th month. Total doses of less than 50 mgm. per kgm. were not so effective in removing microfilariae as the larger doses, but otherwise there was no relation between dose and effect. No symptoms of any kind were reported by 84 out of 118 patients who had been asymptomatic before treatment ; and there was no suggestion that death of the worms had produced any adverse effect on the patients. Thirty-two patients had symptoms of lymphangitis long or shortly before treatment ; of these, 18 had no complaints during the follow-up period ; 3 had slight symptoms ; 7 had several filarial attacks ; 4 were not improved by treatment. Of 39 cases with elephantiasis before treatment, 5 showed permanent recession of swellings shortly after treatment ; 9 showed no improvement of swellings (5 of these suffered from attacks of lymphangitis).

It is concluded that Hetrazan has a permanent effect in reducing or abolishing the number of microfilariae in the blood, and that this suggests lethal or sterilizing action on the adult worms. *F. Hawking*

Maldonado, J. F., Hernández Morales, F., Vélez Herrera, F. & Thillet, C. J. **The Role of Hetrazan in the Control of Filariasis** *bancrofti*. *Puerto Rico J. Pub. Health & Trop. Med.* 1950, Mar., v. 25, No. 3, 291–9. [Spanish version 300–309.]

Observations were made at a Home for Boys in Porto Rico in which there were four blocks (dormitories) housing 269 schoolboys. During a preliminary search, 29 boys were found with microfilariae of *W. bancrofti*. Collections were made of *Culex quinquefasciatus* [*fatigans*] (about 100 were present on each floor) and the percentage of these found to be infected varied from 3·8 to 35. The nearest other house was half a mile away and the boys did not use mosquito nets. On April 13th, 1948, 24 of the boys with microfilariae (*i.e.*, all those with appreciable infections) started to take hetrazan 2 mgm. per kgm. body weight thrice daily for 21 days. Various other boys were also treated later because they were new entrants, or had newly-discovered infections. Many of these were treated for 7 days only, which was almost as effective and much more convenient than treatment for 21 days. Out of 30 boys treated, 26 were free from microfilariae at the end of treatment ; a few of these subsequently relapsed. Those who remained positive left the Home, responded to further repeated treatment or their infection was considered negligible. The treatment produced a drastic reduction in the percentage of infected mosquitoes so that only 0–8 per cent. were found to be infected in different batches, but it was never possible to obtain complete or permanent eradication in any of the buildings or floors. This failure was due in part to the maturation of latent infections in some of the other children. The observations were continued for 13 months.

The authors conclude that " the drug constitutes the single, most effective weapon in the control of filariasis *bancrofti* at present." Of course it should be combined with antimosquito measures and with education. [This is an interesting and valuable paper which should be consulted in the original by those interested.] *F. Hawking*

VANBREUSEGHEM, R. Difficultés du diagnostic de la filariose à *Loa-Loa* et son traitement par la diethylcarbamazine. [**Difficulties in the Diagnosis of Filariasis due to *L. loa* and its Treatment by Diethylcarbamazine Hetrazan.**] *Ann. Soc. Belge de Méd. Trop.* 1950, Mar. 31, v. 30, No. 1, 71–7, 1 fig. on pl.

The author describes 14 patients showing Calabar swellings and filarial pruritus (*gale filarienne*) [this *Bulletin*, 1943, v. 40, 852; 1947, v. 44, 229]. The latter occurs on the trunk or proximal part of the limbs; it consists of violent pruritus (often beginning in the evening) and papules. Progressively the skin becomes infiltrated and later lichenified. The condition is chronic and may persist for many years after a return to temperate climates. The two lesions co-existed in only three of the 14 patients. Diagnosis may be difficult in the early stages. Eosinophilia is usually high (40–60 per cent.) and this is suggestive. Microfilariae of *Loa loa* are rarely found in the blood. In two of the cases an adult worm appeared under the skin. Microfilariae of *Onchocerca* were not found in any of the patients and no nodules were present. These facts, together with the association with Calabar swellings, strongly suggest that the pruritus was due to *Loa*.

Treatment consisted of Hetrazan 2 mgm. per kgm. of body weight thrice daily by mouth for 21 days. Ingestion of the drug was followed by a papular eruption and violent pruritus usually in 1–2 hours, sometimes as late as 48 hours. It was localized to the site of the previous lesions (Calabar swellings or filarial pruritus); the pruritus was much diminished if an antihistamine drug was given simultaneously with the Hetrazan. Of twelve cases studied in detail, 7 were cured by a single course of Hetrazan, 2 were cured by two courses and 3 relapsed after two courses.

F. Hawking

WANSON, M., BORGERS, G. & PANNIER, L. Activité de l'Hétrazan sur *Dipetalonema streptocerca*. [**Activity of Hetrazan on *D. streptocerca*.**] *Ann. Soc. Belge de Méd. Trop.* 1950, Mar. 31, v. 30, No. 1, 91–5.

Twelve African school children in the Léopoldville region infected with *Dipetalonema streptocerca* were given Hetrazan, 0·8 mgm. per kgm. of body weight thrice daily for 6 days. Microfilariae disappeared from the skin in less than 48 hours and there were no allergic reactions (such as occur in onchocerciasis) apart from slight and transitory attacks of urticaria which occurred on the third day in a few of the children (in 6 out of 42 patients altogether). Six other children were given 1·25 mgm. per kgm. thrice daily for 6 days with similar results. In a third trial at Coquilhatville, Hetrazan citrate was given to 18 adults, 0·8 and 1·25 mgm. per kgm., each thrice daily for 5 days in two separate courses. One patient, infected with microfilariae of *Loa loa*, was free from them at the end of treatment. In several patients microfilariae of *Acanthocheilonema perstans* were present and these were not eliminated by the treatment. In the patients with *D. streptocerca*, the microfilariae disappeared from the skin within one or two days. The patients were followed for 8 weeks, but microfilariae of *D. streptocerca* did not return. From a final series of 6 adult patients it was concluded that 6 mgm. per kgm. of Hetrazan daily in divided doses should be given for 8 days in infestations by *D. streptocerca*. The effect of the drug on the adult worms is not yet known. No pathogenic effects of *D. streptocerca* are known at present.

F. Hawking

Bertram, D. S. **Studies on the Transmission of Cotton Rat Filariasis. II. Factors influencing the Efficiency of the Vector, *Liponyssus bacoti*. With a Statistical Analysis** by P. Armitage. *Ann. Trop. Med. & Parasit.* 1950, Apr., v. 44, No. 1, 55–83, 11 figs. [14 refs.]

The filariasis of the cotton rat to which this paper refers is due to *Litomosoides carinii* and is transmitted by the mite *Liponyssus bacoti*. The percentage infection rate in a mite series fed on an infected rat is not a simple linear function of the microfilarial density in the peripheral blood of the rat. Up to a density of about 200 mf. /cmm. the infection rate in mite series increases rapidly to about 60 per cent. At densities from 200 to 1,200 mf. /cmm. the increase in infection rate is less and does not exceed 86 per cent., subject to a great degree of variation.

Some possible causes of this variation and of the inflection of the curve at a density of 200 mf. /cmm. are considered. Variation intrinsic to the experimental methods might be due to the relative humidity at which infected mites were stored during the development of the microfilariae in them, to the time of year, or the point during three years' work at which the mites became infected, or to differences, dependent on the severity of the infection, in the mortality of mites either while free on the rat or during storage. Each of these possibilities is shown to be unlikely, either in the present paper or in the previous one by the same author [see this *Bulletin*, 1950, v. 47, 482].

It is shown that individual mites contain fewer worms than one would expect from the known microfilarial density in the host's blood, and from the amount of blood thought to be taken by a mite during engorgement. Arguments based on the supposition that there is a mechanical limit to the number of microfilariae taken up by a mite at engorgement, or genetical differences of susceptibility in different mites, or that the reactions of the mite to the worms cause this discrepancy are not consistent with the given figures.

The deficit of worms observed in infected mites must therefore be due to a lack of infectivity in a proportion of the microfilariae in the peripheral blood of the rat. Since the deficit is greatest when the microfilarial density is greater than 200 mf. /cmm., the proportion of non-infective forms must be greatest at that density. However, the size of this proportion cannot be due simply to a high microfilarial density, because both high and low infection rates have been obtained in mite series infected from multiply-infected rats whose blood has very high microfilarial densities. The highest infection rates are obtained in mite series fed on rats whose infection is between 100 and 200 days old, although there is a wide variation in the microfilarial density at this time. As microfilariae may survive in the blood for some weeks it is suggested that the infectivity of the microfilariae may depend upon their age, and that the high infectivity associated with high microfilarial density may be due to the presence of a large number of microfilariae of a particular age at this time. However, equally high infection rates may be obtained from cotton rats whose infection is 100–200 days old, but which show no peak in microfilarial density. The evidence from rats with multiple infections eliminates the possibility that a combined effect of age and microfilarial density controls the infectivity of the microfilariae.

The author therefore postulates a factor which suppresses the infectivity of microfilariae, and is dependent on the number of living adult worms present in the pleural cavity of the rat. The hypothesis is borne out by the increase in infectivity of the microfilariae, allowing for the decrease in their absolute density, during the terminal stages of the infection, when adult worms are being destroyed by the tissues of the rat.

The statistical appendix demonstrates an association between the infectivity of microfilariae and the age of the infection which is, apart from this, independent of the microfilarial density and of factors specific to individual rats. It is also shown that the survival rate of infected mite series is *positively* associated with their infection rate.

The result of the interaction of these factors is that series of mites fed on cotton rats with less than 200 mf./cmm. of peripheral blood and infections less than 50 days old, are most suitable for precise quantitative transmission of the infection. The same is true of the mosquito vectors of human filariasis.

J. H. Sudd

BOEHNCKE, H. Ist der Nachweis von Trichocephaluseiern im Stuhl belanglos ? [**Is the Discovery of the Eggs of *Trichuris trichiura* in the Stool Significant ?**] *Med. Klin.* 1950, Apr. 7, v. 45, No. 14, 436–8. [11 refs.]

SCHUBERT and FRANK (*Deutsch. med. Rundschau*, 1949, v. 3, 315) found eggs of *Trichuris* in 3 out of 200 persons in Tübingen. Post-mortem studies recorded higher figures, *e.g.* in Erlangen 12 per cent., in Kiel 29·5 per cent. In Lausanne *Trichuris* is commoner than *Ascaris*. FISCHER (*Deut. med. Woch.*, 1921, v. 47, 477) recorded an incidence of 4·3 per cent. in Germany, 64 per cent. in Russia and 72 per cent. in Italy. Does the presence of *Trichuris* eggs indicate disease and can certain symptoms be referred to this nematode ?

TEUSCH (*Med. Klin.*, 1948, v. 43, 431) did not find the bloodstained mucous diarrhoea and severe anaemia mentioned in textbooks, but rather symptoms similar to those of appendicitis or tuberculosis of the ileocaecal glands. He found haemoglobin percentages of 70 to 80 per cent., and in 26 per cent. of cases there was an eosinophilia of 10 to 30 per cent. The blood sedimentation rate was normal. He ascribed nausea, retching, loss of appetite and disturbances suggesting ileus to the worms and these symptoms disappeared after treatment. The post-mortem findings of NAUCK (*Med. Welt.*, 1929, v. 3, 1404) and STAHR (*Deut. med. Woch.*, 1922, v. 48, 1274) suggest how such symptoms arise. The presence of haemorrhagic areas in the intestinal mucosa, which extended to the serosa and in which there were eosinophils and several worms, explain the symptoms. It is less known that *Trichuris* can cause eosinophil infiltration of the lungs, but the author quotes a case of this found by Professor PRÉVOT, in which the sputum contained eggs of *Trichuris* and also eosinophils and the blood showed an eosinophilia of 10 per cent. Boehncke thinks that the mature worms had entered the lungs by being aspirated during vomiting and had then developed in the lung tissue.

While looking for *Ascaris* eggs in children the author repeatedly found eggs of *Trichuris*. He formerly regarded *Trichuris* as being unimportant, but *Trichuris* can undoubtedly cause death. The truth probably is that its effects vary from harmlessness to ability to cause death.

To eradicate it the author used Spirocid, an arsenical preparation identical with Osarsol. A table gives details of 9 patients, aged $2\frac{3}{4}$ to $11\frac{1}{4}$ years, who were thus treated. In 7 of the 9 the symptoms disappeared after treatment. Three of the 9 were diagnosed as appendicitis or umbilical colic ; in one pelvic peritonitis with an abscess in Douglas's pouch developed. Anaemia was not found. The eosinophils varied from 5 to 48 per cent. Five children came from parts of the town in which *Ascaris* was common.

The author concludes that *Trichuris* is not to be regarded with indifference. The finding of its eggs in the stool indicates that the worms may be the cause of umbilical colic and symptoms suggesting appendicitis or tuberculosis of the ileocaecal glands. Anaemia is not necessarily present, but an eosinophilia

above 10 per cent. can be regarded as an indication of possible infection with this worm. Treatment with Spirocid appears to give good results.

G. Lapage

SCHÜFFNER, W. & SWELLENGREBEL, N. H. Der dritte Infektionsweg für Oxyuren, die "Retrofektion". (Vorläufige Mitteilung.) [**The Third Mode of Infection with** *Enterobius vermicularis*, **namely "Retrofection". (Preliminary Communication).**] *Zent. f. Bakt.* I. Abt. Orig. 1949, Aug. 25, v. 154, Nos. 3/5. Bericht pp. 138*–9*.

The authors say that their Amsterdam researches established the fact that infection with dust explains many, but not all, the obscurities in the life of *Enterobius*. They sought to answer the question : Can larvae that are hatched at the anus of the patient develop further ? They put 50 to 150 larvae in at the anus of 5 persons. It was not possible to examine the first of these persons for long enough and in the second an existing threadworm infection was discovered on the third day after the experimental infection with larvae. In the 3 other persons the larvae developed.

In one of these 3 the pre-patent period was 43 days, which is within the authors' latest records of 37 to 57 days ; but the two others needed 76 days. The infection thus given experimentally lasted 14 to 18 days, while peroral infections last 11 to 35 days. In one of the 3 persons successfully infected through the anus the infection then ended. In the oldest of them, after about 16 months, 27 recurrences had been noted. In the remaining one there had been, after 9 months, just as many recurrences. It was characteristic of the infections that they showed a chronic, irregular, intermittent course with scanty production of worms. The authors call them infections of Type R (Retrofection), in contrast to Type D (Digital), Type C (Contact) and Type S (Dust). The authors suggest that retrofection rather than digital infection is the cause of chronic enterobiasis of adults, the larvae being able to enter the body through an open backdoor.

G. Lapage

MARKEY, R. L. **An Anal Swab Method for Detection of** *Enterobius vermicularis*. *Amer. J. Clin. Path.* 1950, May, v. 20, No. 5, 493.

The author's method consists in coating an ordinary cotton swab with a melted mixture of 4 parts of vaseline and 1 part of Parowax (Standard Oil Company). If the mixture is too hot, the swabs may require to be dipped twice to ensure sufficient coating. They are placed, when cool, in 13×100 mm. culture tubes, plugged with cotton and given to the patient, who brushes them lightly over the skin around the rectum and inserts them about $\frac{1}{4}$ inch into the rectum. This should be done on waking on each of two successive mornings.

At the laboratory, the tubes are half-filled with xylol and allowed to stand for a few minutes until the vaseline-Parowax mixture has dissolved. The swab is then removed and the tube centrifuged. The sediment is examined for *Enterobius eggs*.

In the paediatric department of the Memorial Hospital, South Bend, Indiana, 400 examinations made in this way resulted in 72 positive findings, which were confirmed by subsequent examination.

It is claimed that this method yields better results than the Cellophane swab technique, since it eliminates any accompanying discomfort which may occur, overcomes the microscopic difficulties associated with the presence of Cellophane cells, wrinkling and air bubbles and has the value of being essentially a concentration method. As many as 30 ova per field (low-power) have been found in heavy infestations.

H. J. O'D. Burke-Gaffney

WARNECKE, W. Zur Behandlung der Enterobiasis vermicularis mit Gentianaviolett. [**Gentian Violet in the Treatment of *Enterobius vermicularis* Infestation.**] *Med. Klin.* 1950, June 9, v. 45, No. 23, 737–9.

Gentian violet, first used by FAUST and YEO for infestation by *Strongyloides stercoralis* infestation, was later given by FAUST for enterobiasis. In this contribution the author reports his results of treating patients with two gentian violet preparations which he designates Gentian Violet G and Gentian Violet B, but he does not define either of them. The former was given in tablets, in doses of 0·01 gm. for each year of life, daily for 10 days, for children ; adults received 0·06 gm. three times daily, unless contra-indicated by " disease of the heart, liver, kidneys or intestine." The latter preparation was given in dragées containing 20 mgm., 6–9 daily before meals, usually for 7 days but in one patient for 8 days. Children of 7–8 years were given 2 dragées daily (40 mgm.). Preparation G caused no discomfort, but B might cause loss of appetite, nausea and vomiting. None of the patients could be kept under observation for the usual 93 days and only one for as long as 57 days. There is no need to give the detailed results—they are shown in tables for those interested—for the results were not satisfactory. *H. Harold Scott*

KUITUNEN-EKBAUM, E. & JAMES, Dorothy M. **Diphenan in the Treatment of Enterobiasis.** *Canadian J. Pub. Health.* 1950, Apr., v. 41, No. 4, 167–9. [13 refs.]

Diphenan (p-benzylphenyl carbamate) was investigated from the points of view of its toxicity to rats and mice and its therapeutic value in the treatment of *Enterobius vermicularis* infection in man.

Forty white rats and forty white mice were given doses of 0·5 or 1·0 mgm. per gramme of body-weight daily for twenty days. The drug was given by stomach tube as a suspension in 5 per cent. gum acacia. No ill-effects were noted ; they gained in weight and there was an insignificant increase in the haemoglobin concentration in the blood.

Clinical trials were undertaken with 110 children and 6 adults. (No results are given with reference to 37 children and one adult, thus this report refers only to 73 children and 5 adults.) The total dosage was essentially that recommended by the British Drug Houses (except that larger doses were given to the 6–9 years group). The single doses were :—

Infants up to 2 years	¼ tablet [each tablet=0·5 gm.]
Children from 2 to 5 years	½ tablet
Children from 6 to 9 years	¾ tablet
Children from 10 to 13 years	1 tablet
Children over 13 years and adults	2 tablets

These doses were given [presumably by mouth] for seven days, and repeated for another seven days after a seven-day interval free from the drug. The total dosages of the complete courses for the five age-groups were, thus, 10½, 21, 31½, 42 and 84 tablets, or 5·25, 10·5, 15·75, 21 and 42 grammes, respectively.

One week after the completion of the course, NIH swabs were taken daily for seven days.

After a single course of treatment, post-treatment swabs were negative in 32 (or 44 per cent.) of 73 children, and in 3 of 5 adults. After a second course of treatment 4 of 13 children gave negative swabs and 10 were still positive [the discrepancy is not explained] and both adults gave negative swabs.

No ill-effects were noted in any case.

Post-treatment re-infection could not be excluded, as in many instances there were other untreated children in the same households.

It is concluded that these trials indicate that Diphenan is not completely effective in all cases of enterobiasis but is valuable where other drugs in use are contra-indicated. Because of ease of administration, it is useful in the treatment of small children. *L. E. Napier*

WAGNER, O. Trichinose bei Tier und Mensch. [**Trichiniasis in Animals and Man.**] *Zent. f. Bakt.* I. Abt. Orig. 1949, Aug. 25, v. 154, Nos. 3/5, Bericht pp. 155*–60*, 1 fig.

The author mentions, without a reference, a paper by CROSS and ALLEN (1948) which records the house cat as a host of *Trichinella spiralis*, and says that he can confirm this. He quotes the discovery by Cross and Allen of *Trichinella* in 17 per cent. of 100 dogs and in 21·6 of 51 cats examined in Chicago and says that these authors relate this to their discovery, in the same city at the same time, of *Trichinella* in 16 per cent. of 428 human corpses. Wagner thinks that the cat is very much more susceptible than the dog and that it has an important epidemiological significance and that infection of it may possibly suggest human infection.

The author also refers to the work of MATOFF in Bulgaria, who found that lambs, sheep and dogs are experimentally susceptible, but that older dogs, which are easily infected by the intravenous, intraperitoneal and intramuscular routes, are resistant or almost immune to peroral infections. Matoff also found that hen chickens and young pigeons could be infected perorally, although the infection died out in about 4 weeks. These animals, however, like the ruminants, need hardly be considered as possible sources of human infection. Matoff further showed that susceptible hosts can be infected intratracheally and intranasally. He introduced *Trichinella* larvae through the anus of the guineapig, rabbit, dog and cat, and they developed. Wagner compared this experimental infection with the natural peroral infection of man with *Enterobius vermicularis* [see SCHÜFFNER and SWELLENGREBEL above]. Sexually mature *Trichinella* larvae placed [? by Matoff] in the peritoneal cavity developed larvae as they do in the intestinal wall.

Wagner then briefly compares trichiniasis in man and animals. Pigs and wild carnivores are the original hosts and are well-adapted to *Trichinella*, so that they suffer only occasionally from its effects. Man is a relatively new host and suffers more. Discussing the light symptoms caused in animals, Wagner records his studies of pigs, in which the symptoms were less evident or absent and eosinophilia was not always present, or there was, 2 weeks after infection, a sudden eosinophilia of 10·5 to 22·5 per cent. and then a rapid fall to normal values. Subsequent infections had no effect on the eosinophilia and there was no certain evidence of " allergy " in the pig. Details are given of observations on individual pigs.

Matoff found larvae in the brain and cerebrospinal fluid of guineapigs and dogs infected experimentally. Wagner, in one of his pigs, found 1 larva in the brain, 5 in the spinal cord, about 1,000 in the lungs, 1 in the heart muscle, 1,000 in the liver and none in the spleen and kidney. The work of GAASE [below] is also quoted.

To obtain *Trichinella* antigen Wagner fed unthrifty pigs at weekly intervals with the flesh of infected rats and, 4 to 6 weeks after the last feed, minced and artificially digested their muscles and isolated the larvae by washing. The larvae were dried and antigen dilutions were made from the dried larvae. He considers that for diagnosis a combination of skin and complement fixation tests give the best results. *G. Lapage*

GAASE, A. Der immunbiologische Nachweis der Trichinose bei Mensch und Tier. [**The Immunological Diagnosis of Trichiniasis in Man and Animals.**] *Ztschr. f. Hyg. u. Infektionskr.* 1949, Aug. 4. v. 129, Nos. 5/6, 570–76. [44 refs.]

This paper discusses past work on this subject by the author and others. Most of the work has been summarized in this *Bulletin*, the *Bulletin of Hygiene* and the *Bulletin of War Medicine*. The author himself especially studied the complement fixation reaction and found that better results are obtained with a pig antigen than a rat antigen. He found the complement fixation reaction useful for diagnosis during the first few days of trichiniasis and also obtained positive results with it in human beings as long as 23 years after the disease. One series of patients studied by him suffered nervous symptoms, such as sleeplessness, symptoms resembling those of meningitis, change of mood and reflexes, delirium, etc., and, postulating the action of a *Trichinella* toxin on the nervous system as the cause of these symptoms, the author fed guineapigs with brain substance taken from one of these patients who died, and he obtained, two days after giving this to them, a positive complement fixation reaction [see also WAGNER above].

The drawback of serological diagnosis of trichiniasis is its dependence on the laboratory, and the skin test was for this reason studied by various authors whose results the author briefly summarizes. Most of this work also has been summarized in this *Bulletin*. For the campaign against the danger of an increase of trichiniasis in Germany after the first world war serological methods made it possible to get rid of infected animals. The author and others could not obtain with the skin test results free from doubt, but Gaase was able to diagnose trichiniasis in rabbits and guineapigs with the complement fixation reaction. Possibly the skin sensitivity of the pig is less marked. Every detail of the preparation of the antigen is also important. Of greater importance, in Gaase's opinion, is the choice of the right antigen, and this was the reason for the use of pig antigen instead of the rat antigen. Observations made on animals suggest that the use of an antigen adapted to the host could abolish conflicting results and could make serological tests valuable for preventive measures and might possibly replace the costly and time-consuming meat inspection. *G. Lapage*

SPRUE

JIMÉNEZ DÍAZ, C., MARINA FIOL, C., ROMEO ORBEGOZO, J. M. & PÉREZ GÒMEZ, A. Repercusiones generales de las enteritis. Consideraciones sobre la significación y naturaleza del esprue. [**On the Nature of Sprue.**] *Rev. Clin. Española.* 1950, Apr. 15, v. 37, No. 1, 9–18, 3 figs. [42 refs.] English summary.

The authors bring forward yet one more theory as to the nature and the causation of sprue. The fat-absorption, or rather the defective fat-absorption, generally regarded as one of the cardinal characters, is, they maintain, not a constant feature. The symptoms are due in part to loss of nutrition, but also in part to absorption of toxins, and both of these are the result of change in the normal intestinal bacterial flora. As a consequence of this, histamine is produced to excess and the food vitamins are destroyed or rendered inert and nutrition thus impeded. Folic acid, the success of which has been recorded

often in tropical sprue, has proved ineffectual in their hands in non-tropical cases ; it has less action on the anaemia than has liver extract and does not influence absorption. They refer to the " Addisonian aspect " of sprue patients and lay stress on endocrine dysfunction. They do not imply that adrenal inadequacy causes sprue, and the " suprarenal picture is more apparent than real " and the " sprue enteritis can in certain circumstances bring about an adrenal inadequacy." Hypophysis and gonad insufficiency they believe, and, in fact, find more common, evidenced by coeliac disease, rickets, and secondary osteomalacia ; in others by a eunuchoid aspect, scarcity of pubic hair and impotence, in sprue patients who previously were normal and had begotten children. Future study, they say, should be along the lines of investigating the intestinal flora and its activities, especially the histamine production or " biological evaluation ".

To sum up : Sprue is the result of an enteropathy, the origin of which may be exogenous, as infection by *Salmonella, Shigella,* or by virus ; or parasitic as by *Entamoeba, Giardia, Balantidium* ; or dyspeptic of hepatic or pancreatic origin, or purely malnutritional effecting changes in the equilibrium of the intestinal flora and altering profoundly substances essential for the body, destroying or interfering with the formation of essential vitamins, or " the unknown factors " which constitute the elements necessary for the formation of hormones or ferments. [The paper contains other rather speculative matter, but the above will suffice to indicate its general trend.] *H. Harold Scott*

Fox, H. J. **Sucrose Absorption in Sprue.** *J. Lab. & Clin. Med.* 1950, Apr., v. 35, No. 4, 622–5, 2 figs.

This simultaneous absorption of glucose and fructose was studied in ten healthy adults and in seven adult patients with sprue. Sucrose (100 gm.) was given orally to the fasting subject and glucose and fructose were determined at intervals in samples of venous blood.

In the controls the blood glucose rose promptly and then began to fall rapidly. The fructose values rose more slowly and after three hours had returned to fasting levels. In patients with sprue, the blood glucose rose fairly promptly but the mean rise was much lower than normal. The blood fructose rose more slowly, was sustained and did not fall to fasting levels in three hours. " It would seem that the sustained rise of fructose by the patient with sprue is abnormal, the explanation of which is not clearly understood."

The levels are shown in a table and two graphs. *J. H. Birkinshaw*

HAEMATOLOGY

Abbott, P. H. **The Sickle Cell Trait among the Zande Tribe of the Southern Sudan.** *East African Med. J.* 1950, Apr., v. 27, No. 4, 162–3.

" A small survey of hospital admissions among the Zande tribe of Southern Sudan revealed an incidence of the sickle cell trait of eighteen per cent. The incidence in the general population is probably lower than this. Ten cases showing the sickle cell trait out of nineteen cases of leg ulcer suggest a correlation, though the figures are, of course, too small for deductions."

Beacham, W. D., Mickal, A. & Beacham, D. W. **The Diagnosis of Sickle Cell Disease associated with Pregnancy.** *Southern Med. J.* 1950, May, v. 43, No. 5, 442–6. [30 refs.]

"(1) Because of the fact that the incidence of sickle cell disease associated with pregnancy is probably less than 1 per 1000 cases the disorder is apt to be overlooked.

"(2) Because of its protean manifestations the diagnosis of sickle cell disease is not always readily made.

"(3) Because of the high incidence of complicating disorders associated with sickle cell disease during pregnancy the differential diagnosis may be difficult.

"(4) The demonstration of the sickling phenomenon is one of the prerequisites for diagnosis of sickle cell disease. Therefore, we advocate that all pregnant Negresses having anemia, jaundice, sepsis, histories suggestive of sickle cell disease or bizarre symptoms be given the benefit of sickling tests. If such tests are positive, complete hematologic surveys should be done."

Singer, K., Motulsky, A. G. & Wile, S. A. **Aplastic Crisis in Sickle Cell Anemia. A Study of its Mechanism and its Relationship to other Types of Hemolytic Crises.** *J. Lab. & Clin. Med.* 1950, May, v. 35, No. 5, 721–36, 3 figs. [28 refs.]

DERMATOLOGY AND FUNGUS DISEASES

Rosenthal, S. R. & Elmore, F. H. **Studies on the Contagiousness of Coccidioidomycosis. III. Infection in Guinea Pigs by Contact with Diseased Animals.** *Amer. Rev. Tuberculosis.* 1950, Jan., v. 61, No. 1, 106–15, 6 figs.

To test the possibility of direct transmission of coccidioidomycosis from animal to animal, the authors kept a number of healthy guineapigs in close contact with others which had been artificially infected by introducing infective sputum or pus directly into the bronchi. The infective pus caused extensive pathological changes of a pneumonic character in which minute yellow areas of softening were prominent. The associated lymph nodes were enlarged to about 1·5 cm. but there were no extrathoracic lesions. The fungus was seen in preparations from the lesions and it was also isolated from them in culture. The animals infected from sputum showed less extensive lesions of the lung but very marked enlargement of the hilar lymph nodes. All of the animals used were negative to coccidioidin at the beginning of the test. In each of two cages numbered I and II respectively, two animals infected by sputum were placed in contact with three healthy animals, and in two other cages marked III and IV one animal infected by pus was placed in contact with three or four healthy animals. Coccidioidin skin tests were carried out at intervals of three weeks but the results of the tests, with coccidioidin at 1 : 10, were equivocal and were not correlated to the subsequent pathological findings. Nevertheless, all of the inoculated animals became sensitive to coccidioidin and some of the contacts also gave the reaction in a lesser degree. Of the 13 healthy guineapigs in contact with the 6 infected animals, three developed pulmonary lesions and the parasitic spherules of *Coccidioides immitis* were found in all three and also in a fourth animal which did not show pulmonary, or any other, lesions. Many of the animals died and the remainder were sacrificed at the end of the test. The period of contact ranged from 46 days to 175 days.

Under the conditions of this experiment, 4 out of 13 healthy guineapigs kept in close contact for 46 to 175 days with animals suffering from artificially induced coccidioidomycosis of the lungs, showed gross lesion of the lung, and 6 others had positive skin tests. Presumably, precautions were taken to exclude the possibility of infection by a saprophytic growth of the fungus vegetating in an environment contaminated by the inoculated animals.

J. T. Duncan

KAHN, M. **Primary Coccidioidomycosis and Concomitant Tuberculosis.** *Amer. Rev. Tuberculosis.* 1950, June, v. 61, No. 6, 887–91, 3 figs. [15 refs.]

"A case of primary coccidioidomycosis and coexistant primary tuberculosis is presented. The difficulties in evaluating the respective parts played by the two diseases in producing the clinical symptoms and roentgenographic abnormalities are discussed."

MACKINNON, J. E. & VINELLI, H. Caracteres diferenciales de *Paracoccidioides brasiliensis* y *Blastomyces dermatitidis* en los tijedos. Utilidad de la coloración con el carmín de Best. [**Differential Characters of** *Paracoccidioides brasiliensis* **and** *Blastomyces dermatitidis* **in the Tissues. Employment of Staining with Best's Carmine.**] *An. Facul. de Med. Montevideo.* 1950, **v. 35**, No. 2, 299–310, 18 figs. [10 refs.] English summary.

In a previous report by MACKINNON, MONTEMAYOR & VINELLI [this *Bulletin*, 1950, v. 47, 84] it was shown that the cell wall of the parasitic form of *Paracoccidioides brasiliensis* was extremely thin, and the description, by many authors, of a thick cell wall with "double contour" was due to a misunderstanding of the clear achromatic space which surrounds the cell protoplasm. This space is due to shrinkage and retraction of the protoplasm away from the cell wall and it is not a part of the wall. The observation that the cell wall of *P. brasiliensis* is, in fact, very thin, is of prime importance in helping to distinguish this species from *Blastomyces dermatitidis* (the cause of Gilchrist's disease) in the tissues.

The typical mature forms of these two fungi in tissues can be distinguished from each other by their modes of reproduction by budding; *P. brasiliensis* reproducing by multiple buds arising from all parts of the surface simultaneously and *B. dermatitidis* by a single bud which remains *in situ* until it is nearly as large as the parent cell. Immature forms of these two species, or even of *Coccidioides immitis*, in the tissues are difficult to distinguish from each other, but a greater difficulty in diagnosis arises when *P. brasiliensis* reproduces by a single bud instead of multiple budding. In this circumstance the fungus is very easily mistaken for *B. dermatitidis*, and the authors attribute the reports of TALICE and MACKINNON (1933), NINO (1938) and DA FONSECA (1943), on the occurrence of Gilchrist's disease in Uruguay, Argentina and Brazil respectively, to this kind of mistake in the absence of a culture of the causative fungus for examination.

In the present work a study was made of the fungi in paraffin sections of tissues from authentic cases of Gilchrist's disease and South American blastomycosis, stained by haematoxylin and eosin, by Heidenhain's iron haematoxylin and by haematoxylin and Best's carmine. The last of these gave the most useful results. The earlier observation that the cell wall of *P. brasiliensis* is extremely thin was confirmed and it was shown that the cell wall of *B. dermatitidis* was relatively thick; about 3 to 4 times as thick as that of *P. brasiliensis*. This is a useful differential character between fungal cells which in other respects are indistinguishable from each other. Slight differences which were noticed in

the staining reactions to Best's carmine of *B. dermatitidis* from two different cases are attributed to probable differences in the method of fixation of the tissues.

The authors conclude that reports of the occurrence of Gilchrist's disease in South America rest on inadequate evidence. *J. T. Duncan*

TROPICAL OPHTHALMOLOGY

CANCELLARA, E. Sulla endemia di tracoma in un grosso agglomerato urbano e sulla attuale organizzazione della lotta antitracomatosa in Italia. [**The Prevalence of Trachoma in a Large Urban Population and the Present Organization to deal with it in Italy.**] *Ann. d. San. Pubblica.* Rome. 1950, Jan.–Feb., v. 11, No. 1, 99–119, 5 figs. & 1 folding coloured map. [17 refs.] English summary.

This article is crammed with detail, undoubtedly of much local interest, but, for the general reader, of interest only in its deductions. The author has studied the question of trachoma, from the epidemiological aspect, in the town of Bari. Bari is divided into two main parts, Old and New Bari, and each of these again into several districts or wards. The total population is about 227,000 and that in S. Nicola (Bari Vecchia) about 28,000. The figures of prevalence of trachoma on which the author's statements are based were obtained from patients attending the University Ophthalmic Clinic in the period 1925 to 1948 ; also from those applying for treatment at the Provincial Assistance Organization (*Ente provinciale antitrachomatoso*) and from a census of school-children as reported by Santonastaso in 1927–1929, those attending the Clinic in 1935–1937 and others seen at an inspection in 1948 ; lastly, from a survey of the families of trachomatous school-children in 1948.

The data thus obtained are presented in a series of tables and graphs for each of the years mentioned and in consecutive quinquennia of the ages of those examined ; these tables show the numbers examined each year and the numbers found infected and the percentages calculated thereon. Those interested should consult the original for details ; here we can point out only the general results. Trachoma incidence is high. In the first 17 years of the period dealt with the percentage varied between 16 and 41, but the annual average examined was 2,512 of whom 662 (26·3 per cent.) were infected ; in the last 7 years, 1942–1948, the annual average was 532 infested among 2,603 examined (20·4 per cent.), but of the total 18,219 examined there were 3,723 (20·4 per cent., not 23·8 as stated). A map indicates the areas of relative prevalence.

It is pointed out that the present system of setting up institutions for treating patients in dispensaries, hospitals and clinics is quite inadequate ; far more important is it to undertake investigation of the children's homes and environment, removal of slum dwellings and extensive improvement of the domestic hygienic conditions. *H. Harold Scott*

SCOTT, J. G. **Trachoma in the South African Bantu.** *South African Med. J.* 1950, May 13, v. 24, No. 19, 355–6, 1 fig. [16 refs.]

The purpose of this brief note is to correct the still not uncommon impression that " trachoma is uncommon among negroes " ; and to suggest that trachoma in the Bantu (as in the West African) is of the papillary rather than the follicular type.

Reference is made to previous reports in West, East and South Africa [see this *Bulletin*, 1945, v. 42, 1032, 1033 ; *Bulletin of Hygiene*, 1937, v. 12, 45 ; *Brit. J. Ophthalm.*, 1945, v. 29, 244] and an appendix lists 11, 12 and 5 references respectively to the incidence of trachoma in each of these regions. This indicates that in West Africa incidence rates of 2 to 68 per cent. have been recorded, in East Africa from 12 to 66 and in South Africa from 8 to 42 per cent.

The author's present series consists of routine examination of 300 consecutive patients at an eye clinic for Bantus at Germiston, South Africa. In every case, the everted lids, cornea and limbus were examined by naked eye and by the slit-lamp. Of these, 30 had trachoma and 8 of them had visual impairment. The trachoma was of the papillary type and follicles were seen in only two cases. The diagnosis was suggested in all but 6 by a red, velvety hypertrophied palpebral conjunctiva, or scarring with entropion and trichiasis. Slit-lamp examination showed pannus.

It is stated that the normal limbus in the Bantu is delimited by a band of pigment about 1 mm. broad.

In 6 cases, blood vessels were seen in the clear cornea beyond the limit of pigment without palpebral involvement. It is noted that a similar picture was seen in resolving trachoma in West Africans : it did not improve with riboflavin therapy. It is considered that such vascularity confined to the upper limbus, in the absence of ariboflavinosis, syphilis and corneal disease, is a sign of trachoma. *H. J. O'D. Burke-Gaffney*

HEAT STROKE AND ALLIED CONDITIONS

GROBER, J. Wege und Ziele der Akklimatisationsforschung. [**The Approach to Research in Acclimatization.**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1950, Apr., v. 1, No. 4, 445–58.

The English summary appended to the paper is as follows :—

" The article gives a comprehensive program for research in acclimatization of humans, animals and plants in the tropics and subtropics. The program was drawn before World War II and still deserves international attention. For details the original is to be consulted."

[See also this *Bulletin*, 1949, v. 46, 594.]

MUNRO, A. F. **Basal Metabolic Rates and Physical Fitness Scores of British and Indian Males in the Tropics.** *J. Physiology.* 1949, Dec. 31, v. 110, Nos. 3/4, 356–66, 3 figs. [28 refs.]

The paper reports observations made in India on Indians and Europeans in the Royal Air Force. The two groups of subjects were living under very similar service conditions. Measurements were made of basal metabolic rate, blood pressure, pulse rate, body temperature and physical fitness. The test used to determine physical fitness was the Harvard Pack Test. In Bombay physiological measurements, including basal metabolic rate (B.M.R.), were made on 85 British airmen and 40 Indian airmen, and the Indians also performed the Harvard Pack Test. Some of the Indians were physical training instructors and others were clerks. Half of each occupational group came from the Punjab and the United Provinces, and the other half from Bombay and Madras. Measurements were also made on 20 British aircrew personnel from tropical India who were staying for a month under cold conditions in Kashmir, and for

comparison 3 British skiing instructors who had been in the Kashmir mountains for 6 months, and 3 Kashmir hill porters, were tested. Some other groups of British personnel performed the pack test only.

The average B.M.R. observed for the Indians was 9·6 per cent. below the Aub-DuBois standard, and that for the British group with an average sojourn in the tropics of 10·7 months was 5·6 per cent. below that standard. British subjects who had been in India for three years had a B.M.R. very close to that observed in Indians.

The observations made in Kashmir showed that a few days of exposure to a cold hill climate raised the basal metabolism significantly above the tropical level.

The British group in the tropics had a systolic blood pressure significantly higher than that of the Indian group, and there was no significant decline in the blood pressure with increased length of tropical residence.

Length of residence in the tropics did not appear to influence pulse rate, rectal temperature, or performance in the pack test.

In any occupational group the British subjects made a higher average score in the pack test than did the Indians who were living and working under similar conditions. *Thomas Bedford*

PILLE, G. Les échanges chlorures en biologie tropicale. Accidents graves de déshydratation extra-cellulaire par carence chlorurée climatérique observés à Fort-Lamy (Tchad). [**Chloride Exchange in Tropical Biology. Severe Extra-Cellular Dehydration from Climatic Chloride Deficiency at Fort Lamy (Chad).**] *Méd. Trop.* Marseilles. 1949, Nov.–Dec., v. 9, No. 6, 896–950, 10 figs. (1 map). [13 refs.]

A concentrated study which should be read in the original.

TROPICAL ULCER

HALLINAN, T. C. **Treatment of Tropical Ulcers by Food Yeast.** [Memoranda.] *Brit. Med. J.* 1950, May 13, 1118.

In Jamaica in 1927 the author found a number of cases of tropical ulcer among the labourers and their families. The ulcers were usually of long standing, resistant to treatment, and often broke down.

That the ulcers were due to a vitamin deficiency seemed likely because (1) they occur chiefly among those suffering from malnutrition, particularly where the diet is deficient in vitamin B, and (2) they occur mainly in tropical countries during and towards the end of the hot season, when the body stores of vitamin B will have been further depleted by increased sweating (recent work having shown that vitamin B alone is excreted in the sweat).

Treatment with dried "torula yeast", produced by Colonial Food Yeast Ltd., was therefore tried.

Powdered yeast was applied to the surface of the ulcer, sealed down with elastoplast, and left untouched for one to two weeks, while 4 gm. of yeast in food thrice daily was given until the ulcer was healed. The first six cases, in which the ulcers varied in size from ½ to 5 inches, in diameter, healed up extremely quickly; healing was complete in three to four weeks.

The next 30 cases were divided into two groups: (1) those receiving the yeast treatment; (2) a control group receiving any of the usually recommended treatments, *e.g.*, sealing with elastoplast, acetylarsan, penicillin, sulphonamides.

In group 1, the success of the first six cases was repeated except in four cases which were Kahn positive and took much longer to heal (three to four months) in spite of anti-syphilitic treatment. Those in group 2 proved uniformly slow in healing, the majority carrying on for three or four months, when they were all given yeast with results similar to those in group 1. In all cases treated with yeast the average healing time was two to five weeks according to the size of the ulcer, with the exception of those with positive Kahn tests. Since this experiment yeast has been used as a routine treatment and has continued to give similar results. Later the ulcers were first carbolized before yeast was applied, and this was found to cause a great reduction in the time required for healing ; even those with a positive Kahn reaction healed in four to five weeks.

The standard of cure is complete epithelialization of the ulcer. In no case was skin grafting necessary, and the skin grown over the ulcer was remarkably sound. In 17 months 188 patients have been treated with no failures and only one relapse ; this occurred in a man with an ulcer five inches in diameter over the outer and lower half of the tibia, severe varicose veins and a positive Kahn reaction ; a wooden splinter had caused sepsis over the original site of the ulcer.

The autolysed torula yeast used contains a proteolytic enzyme which may account for the rapid disappearance of pus and sloughs. Twelve cases were therefore treated with other products containing vitamin B, but no proteins or proteolytic enzymes, and the results obtained were similar to those with food yeast except that ulcers showing much pus or sloughs were slower in showing a clean surface and healing was retarded by about two weeks.

Three patients were treated by carbolization and elastoplast alone and good results were obtained, but the time required for healing was about twice as long and the scars seemed not quite so sound. *C. F. Shelton*

GODKIN, S. R. S. **Skin Grafting in the Treatment of Tropical Ulcer.** *East African Med. J.* 1950, Apr., v. 27, No. 4, 173–5.

The author has treated 80 cases of tropical ulcer by skin grafting. Some very severe ulcers involving most of the circumference of the leg were treated, but most of them were about $1\frac{1}{2}$ in $\times$ $1\frac{1}{2}$ in. in extent and were often multiple. Some were very deep, involving muscle, tendon or bone ; the last-named usually required sequestrectomy before grafting. The whole ulcer was excised in one piece, including the floor and a small amount of surrounding skin, all scar tissue around and under the ulcer being removed at the same time. Removal by the knife was found to give better results than curettage. The raw surface was dressed with Z.I.P.P. [Zinc-iodoform-paraffin paste] and left for three days. If it was then found to be clean it was dressed with a compress soaked in normal saline and grafted next day ; if this was not satisfactory, eusol dressings were used until it was clean. Thiersch grafts, cut somewhat thicker than usual, were applied after the granulations were shaved off with a sharp knife or razor. If possible a graft large enough to cover the whole ulcer should be cut, but if this cannot be done, the grafts should be spread on a piece of vaselined gauze, with the raw surface upwards, and gauze and grafts transferred to the surface to be covered. A firm dressing of dry gauze and wool should be applied over this and left for eight days. A course of 18 grammes of one of the sulphonamides during the next 72 hours is advisable. Altogether, 82·5 per cent. of the grafts in the author's series of cases were completely successful and the remainder partially so, two patients required re-grafting and there was one failure. The average stay in hospital was 19·5 days, instead of the 2–3 months usual with other methods of treatment. *W. L. Harnett*

MISCELLANEOUS DISEASES

GRIEBEL, C. Erkrankungen durch Bohnenflocken (*Phaseolus vulgaris* L.) und Platterbsen (*Lathyrus tingitanus* L.). [**Disease caused by the Bean (*Phaseolus vulgaris*) and the Vetch (*Lathyrus tingitanus*).**] *Ztschr. Lebensmittel-Unters. u.-Forsch.* 1950, Mar., v. 90, No. 3, 191–7.

From time to time reports are published of symptoms of poisoning after eating the bean, *Phaseolus vulgaris*, the common kidney bean. Thus, at a farm-school in Germany, after a meal containing these, about 20 per cent. suffered from vomiting, diarrhoea, giddiness and headache, some more severely than others. These symptoms usually cleared up in 36 hours, but might last longer. Analysis showed that these beans contain what are known as *Phasins*, nitrogenous substances which agglutinate red corpuscles, but, taken internally, are usually innocuous ; known exceptions among members of this group are ricin and abrin. Experiments on mice and rats have shown that, eaten raw, the phasins give rise to gastro-intestinal disturbance ending fatally in 3 days, and the chief signs at autopsy are those of severe intestinal inflammation. Cooking destroys the toxin, at least renders it inert, and tests were undertaken to determine for what length of time the cooking must go on to attain this desired effect. A quarter of an hour usually sufficed, but to be on the safe side half an hour is recommended. Whether the toxic principle is an albuminous substance or an enzyme is uncertain ; further work is to be carried out to determine this point.

A similar toxic phasin is present in seeds of *Lathyrus tangitanus*, the African or Tangier vetch, sometimes sold in the black market for lentils. The plant is grown in gardens for ornament. Only prolonged cooking makes the seeds tender, but they are thereby rendered innocuous. [Many names are mentioned in this paper and the authors' findings referred to or quoted, but no bibliography or references to the literature are given.] *H. Harold Scott*

DUMOULIN, F. V. B. Een merkwaardig geval van " creeping disease " of larva migrans. [**An Interesting Case of " Creeping Disease " (Larva migrans).**] *Med. Maandblad.* Batavia. 1949, Dec. 1, v. 2, No. 12, 372–5, 1 pl.

Dumoulin, writing from Palembang, describes and illustrates the clinical features of a form of creeping disease or larva migrans which did not respond to the routine treatment prescribed for this condition. His patient, an eight-year-old child, had several dark-red erythematous papules, some of an urticarial nature and others partly ruptured by scratching, on various parts of the body. At 15 other sites on the trunk, arms, limbs, face and ears there were the typical lesions of linear dermatitis. In some cases the tunnelling originated from the erythematous urticarial papules. The ulnar surface of the left wrist showed an oedematous swelling with 15 bullae which were filled with a yellowish fluid and were surrounded by an erythematous zone. The accompanying lymphangitis is attributed to secondary infection. The causal parasite of the disease was searched for but nothing was found. The author mentions the various larvae which have been recorded as causes but refrains from expressing an opinion as to the likely agent in this case. Because the usual routine treatment failed and because the condition did, in some respects, appear analogous to tunnelling in the dermis by mites, he decided to try benzylbenzoate. An application of the usual 20 per cent. emulsion did produce a slight improvement and less active migration after three days. Encouraged by this, the concentration of the antiscabiotic in the emulsion was increased to 50 per cent. and the

medicated gauze applied under leucoplast. Complete recovery resulted within a week.

The author observes that no mention is made in the literature of the use of benzylbenzoate in the treatment of creeping eruption and suggests that it be tried in those cases which are very resistant to the commonly prescribed treatment. *P. L. le Roux*

GALLIARD, H., BRUMPT, L. C. & MARTINEZ, R. Infections expérimentales à *Trypanosoma cruzi* Chagas chez l'homme à propos de la biothérapie du cancer. [**Biotherapy in Cancer. Experimental Inoculation of** *T. cruzi*.] *Bull. Soc. Path. Exot.* 1950, v. 43, Nos. 3/4, 204–16, 2 figs.

Nearly 20 years ago KARCZAG *et al.* noted that trypanosomes set up an oxygen deficiency and he studied the effect of *T. equiperdum* on adenocarcinoma in mice. They concluded that the growth was slowed and their malignancy was, perhaps, reduced. Two years before, ROSKIN was publishing the results of the action of protozoal toxins on experimental cancers, and made special trial of *T. cruzi*. He found leishmanial forms in disintegrated cancer cells. This was not a purely mechanical action because similar results were obtained by protozoal extracts, or endotoxins, prepared from the blood of infected mice or from cultures, and in 1941 [no references to the literature are given in this paper] he stated that in human cases there was arrest of tumour growth and of haemorrhages, with retrogression of the adenopathy and improvement in the general condition. Subsequently other reports appeared, some in support, some to the contrary.

The authors have infected 26 patients suffering from new-growths, with two strains of *T. cruzi* kept going in *Rhodnius prolixus*, either by subcutaneous inoculation of the blood of infected mice or by inoculation of reduviid faeces into scarified skin. The neoplasms included epithelioma of the tongue, of the tonsils, breast cancer, oesophageal, rectal and others. The trypanosomes could be seen in the blood from the 14th to the 22nd day. Of the 26 patients 11 died between 15 days and five months after the inoculation ; five others were removed by their relations and " we have no proof of their deaths " ; the remaining ten have left hospital and, after being under observation for one to three months, have been lost sight of. During that time favourable results had been noticed from a clinical aspect—reduction in the size of the tumour and in secondaries, less pain and some cicatrization, in different cases. The authors conclude : These trials have been made on advanced and practically hopeless cases, so it is not possible yet to draw any conclusions as to the efficacy of this form of treatment. Readers of this *Bulletin* will be particularly interested in the detailed account of the parasitology, clinical features and course of the experimental infection of human beings with *T. cruzi* : for these valuable details the original paper should be consulted. *H. Harold Scott*

PROTOZOOLOGY : GENERAL

SULKIN, S. E., LODOWSKI, C. H. & HARTMAN, L. W. **Accidental Microscopic Finding of Toxoplasma in Human Blood.** *Texas Reports on Biol. & Med.* 1950, v. 8, No. 1, 45–51, 2 charts. [18 refs.]

One or two previous reports of the discovery of toxoplasms in human blood belong to a period before the existence of toxoplasmosis in man was recognized,

and cannot therefore be verified, while in a recent finding of alleged toxoplasms by DRENOWSKI (*Schweiz. med. Woch.*, 1947, v. 77, 429) their identity was not definitely confirmed.

The authors describe the repeated finding of toxoplasm-like bodies in the blood of an infant of 11 months who manifested a number of typical symptoms of toxoplasmosis (signs of hydrocephalus, facial convulsions, etc.). The organisms were crescentic and piriform with blue-staining cytoplasm and large nuclei. The identity of the parasites was supported by serological studies, which showed that the sera of the patient, of his mother and of two siblings contained toxoplasm-neutralizing antibodies. *C. A. Hoare*

WIKTOR, T. J. Toxoplasmose animale. Sur une épidémie des lapins et des pigeons à Stanleyville (Congo Belge). [**Animal Toxoplasmosis. An Epidemic among Rabbits and Pigeons in Stanleyville.**] *Ann. Soc. Belge de Méd. Trop.* 1950, Mar. 31, v. 30, No. 1, 97–107, 1 fig. on pl. [78 refs.]

The author describes an epizootic of toxoplasmosis among rabbits and pigeons which were bred at a farm near Stanleyville. The outbreak lasted ten days, in the course of which about 80 per cent. of the animals died, with typical symptoms of the disease, which are described in some detail. By cross-inoculation of pigeons with the rabbit strain, and *vice versa*, it was shown that the parasite was interchangeable between the two hosts ; furthermore, both strains were transmissible to mice and guineapigs. [In view of the absence of host-restriction in toxoplasmosis, these findings are of medical interest, for it is conceivable that epizootics among domesticated animals might be of some danger to human beings. However, the author himself does not comment on this question.] *C. A. Hoare*

WENRICH, D. H. & SAXE, L. H. *Trichomonas microti*, **n. sp.** (**Protozoa, Mastigophora**). *J. Parasitology*. 1950, June, v. 36, No. 3, 261–9, 19 figs. [27 refs.]

ENTOMOLOGY AND INSECTICIDES : GENERAL

VAN SOMEREN, E. C. C. **Ethiopian Culicidae : Description of a New** *Aëdes* **from East Africa and Notes on Two Known** *Aëdes* **with which it might be confused.** *Proc. Roy. Entom. Soc. of London*. Ser. B. 1950, Feb. 15, v. 19, Pts. 1/2, 7–10.

VAN SOMEREN, E. C. C. **Ethiopian Culicidae : a Description of Two New** *Aëdes* **of the Subgenus** *Aëdimorphus* **Theobald, from Uganda.** *Proc. Roy. Entom. Soc. of London*. Ser. B. 1950, Apr. 15, v. 19, Pts. 3/4, 39–41, 2 figs.

LACASSE, W. J. **Mosquito Control Problems in Japan.** *Proc. & Papers 17th Ann. Conf. California Mosquito Control Ass., Feb. 7–9, 1949*. 10–12.

Among mosquito-borne diseases in Japan malaria was not notifiable before the present military occupation and cases reported since are probably due to importation by Japanese soldiers ; but from information that is available malaria is not normally a significant public health problem in that country. The figures for the incidence of filariasis are now out of date and fresh surveys are needed. Dengue was unknown before 1942 and there have been no cases recorded since 1945. The most important mosquito-borne disease in Japan is Japanese B encephalitis. Between 1924 and 1948 more than 33,000 cases

were recorded. In the 1948 outbreak there were 2,455 deaths among 8,023 patients, giving a case-mortality rate of approximately 30 per cent. ; and there were 22 cases among members of the Allied Occupation Forces with three deaths. In previous epidemics mortality rates ranged as high as 60 per cent.

There are 40 species of mosquitoes already recorded from Japan ; eight of them are of some medical importance, for they bite man and have been proved experimentally to be capable of the transmission of filariasis. *Culex pipiens pallens* is claimed to carry the virus of encephalitis in nature though *Culex tritaeniorhynchus* may be the principal vector ; *Culex bitaeniorhynchus* also attacks man ; a day-biting mosquito, *Aëdes albopictus*, is the most likely vector of dengue, though there are two other day-biting species, *Aëdes flavopictus* and *Aëdes vexans nipponi* ; *Anopheles hyrcanus sinensis* is the only anopheline likely to be implicated in the transmission of malaria as the other four species are rather rare. In some parts of the country a species of *Mansonia* is a vicious biter.

The countryside abounds in mosquito breeding places both natural and artificial and the problem of control is very diverse and extensive. The mosquito population reaches its peak in August and control measures are required from mid-May to mid-September, at any rate south of Tokio. The areas to be controlled coincide mostly with the arable land, for the rest is mountainous and sparsely populated. A complete scheme would include 34,000 square miles and would require treatment every ten days for four months each season, but it is doubtful whether a total scheme is economically possible. At the moment effective mosquito control in Japan is only just beginning, even in the larger urban centres of population. *H. S. Leeson*

Hill, R. B. & Hill, Claire M. **The Mosquitoes of Jamaica.** *Bull. Inst. Jamaica.* 1948. Science Ser. No. 4. 60 pp., 11 figs.

This booklet is intended as a convenient guide to the fauna of Jamaica for those interested in the routine identification of mosquitoes, particularly for amateurs. Brief descriptive notes on the adult and larval stages of all known species found there are given, together with keys for their identification. The larval key is set out in three groups according to the type of water from which the specimen under examination may have been obtained, and a useful table showing the author's findings in some 20 different types of breeding place is appended. Only general references to the literature are given but this booklet should form a useful and practical introduction to the subject. There is a useful glossary of terms, occupying three pages. *M. T. Gillies*

Perry, W. J. **The Mosquitoes and Mosquito-borne Diseases on New Caledonia, an Historic Account : 1885–1946.** *Amer. J. Trop. Med.* 1950, Jan., v. 30, No. 1, 103–14, 5 figs. [22 refs.]

Thirteen species of mosquitoes occur on New Caledonia : six species of *Aëdes* including *Aëdes aegypti*, five *Culex* including *C. quinquefasciatus* [*C. fatigans*], *Mansonia crassipes* and *Tripteroides caledonica*.

Dengue has been known in New Caledonia since 1885. It was a disease of considerable military importance during the war though there were no deaths in the Allied Forces due to it.

The case rate of dengue in military forces in 1943 was 643 per 1,000 per annum. With the enactment of abatement measures directed against *Aëdes aegypti* the incidence dropped dramatically until in 1946 only an occasional case was reported among troops and inhabitants.

In the absence of suitable species of the genera *Aëdes* and *Anopheles* and the absence of the subgenus *Mansonioides, Culex quinquefasciatus* [*Culex fatigans*] is thought to be the sole vector of *Wuchereria bancrofti* which was reported from blood film studies.

No measures were taken to reduce the incidence of filariasis either by drugs or by attacking potential vectors, but in the course of the dengue control the index of *C. quinquefasciatus* was materially reduced. It is unlikely that troops contracted filariasis in this area.

In spite of the favourable location of the island, its intensive use during the war as a staging area for troops and the constant flow of traffic by sea and air, New Caledonia has remained free of anopheline mosquitoes and malaria to the end of the military occupation in 1946. *H. S. Leeson*

Toumanoff, C. L'intercroisement de l'*Aedes* (*Stegomyia*) *aegypti* L. et *Aedes* (*Stegomyia*) *albopictus* Skuse. Observations sur la mortalité dans la descendance des générations hybrides F_1 et F_2 de ces insectes. [**Hybridization of *A. aegypti* L. and *A. albopictus* Skuse. Observations on the Respective Mortalities of the F_1 and F_2 Generations of this Cross.**] *Bull. Soc. Path. Exot.* 1950, v. 43, Nos. 3/4, 234–40. [14 refs.]

This paper gives an account of the progeny of crosses between male *Aëdes aegypti* and female *Aëdes albopictus*. The author has not been able to obtain the converse cross. The progeny in each of the first four hybrid generations followed the maternal (*albopictus*) type with one exception in the fourth generation.

It might be that in fact the female *albopictus* was not fertilized by the male, but the spermatozoa of the latter only induced a parthenogenetic development of the eggs. However, the author's figures show that the sex ratio is about equal in the first and second generations and in a control. This seems to rule out any question of parthenogenesis. Another possible explanation of the adherence of the hybrids to the maternal type would be the existence of a high differential mortality among progeny of the paternal type, either as embryos or after hatching. The author's experiments show that the hatching rate and the proportion of larvae which eventually became adults are higher in the first two hybrid generations than in controls. Further, the paternal characters are not apparently lethal as one such larva was reared.

The author suggests that this is a case of cytoplasmic inheritance, and one which might be of importance in establishing *Aëdes aegypti* in a fresh habitat, if a female of that species could be fertilized by a male *Aëdes albopictus*.

J. H. Sudd

Neghme, A. Control del *Aedes aegypti* en Chile. [*Aëdes aegypti* **Control in Chile**] *Bol. Oficina Sanitaria Panamericana.* 1950, Apr., v. 29, No. 4, 389–96. English summary.

Shearman, C. E. **The Control of Culicine Mosquito Breeding in Septic Tanks by means of D.D.T. Bricks.** *J. Roy. Army Med. Corps.* 1950, May, v. 94, No. 5, 259–65, 1 diagram.

The experiments were done on War Department land on Singapore Island, where all the septic tanks breed enormous numbers of Culicine mosquitoes, if left untreated. The routine method of treatment was weekly spraying with oil solution of insecticide ; but this was troublesome to do thoroughly and was sometimes badly done.

As an alternative (which has been used elsewhere) the author tried bricks of cement or plaster and sawdust, impregnated with DDT. The cement bricks were not very effective, but good control for a month was secured by hanging one of the plaster bricks in each compartment of the septic tank. The bricks were $4 \times 4 \times 3$ inches in size and made of one part plaster to four parts sawdust (by volume). After drying they were soaked for 24 hours in 5 per cent. DDT solution in anti-malarial oil. The bricks were not effective if dropped into the tanks and had to be suspended six inches below the surface. They were active for four to six weeks in moving water and for three months in stationary water, provided that the surface was free of scum. There were no deleterious effects on the action of the septic tanks. [This method might be tried in areas where *Culex fatigans*, breeding in septic tanks, is an urban vector of filariasis.]

J. R. Busvine

Mathis, W., Ferguson, F. F., Upholt, W. M. & Quarterman, K. D. **The Relative Effectiveness of DDT and DDD as Anopheline Mosquito Larvicides under Field Conditions.** *J. National Malaria Soc.* 1950, Mar., v. 9, No. 1, 95–8.

DDT is well established as a satisfactory anopheline larvicide and is commonly applied as an oil-mist spray at very low dosages, but it has the disadvantage of being toxic to other aquatic organisms, especially fish, when applied frequently.

DDD (2,2-bis(*p*-chlorophenyl)-1,1-dichloroethane) is reported to be less toxic but equally effective as a larvicide.

Comparative trials were made, in all cases with oil solutions disseminated as a mist which was wind-borne over the water surface ; a swath 30 feet broad was used. Various dosages were tested by alteration of the concentration of insecticide in the oil—the dose of which remained constant. Amounts of 0·025 lb. per acre or less of either insecticide gave such erratic results that comparative evaluation is impossible. At doses of 0·025 lb. per acre or more the two insecticides showed no significant difference. The minimum dose for practical field work for either of them is considered to be 0·05 lb. per acre.

G. Macdonald

i. Travis, B. V. & Lindquist, A. W. **Symposium : Ground Pre-treatment for the Control of Mosquitoes.** *Proc. & Papers 17th Ann. Conf. California Mosquito Control Ass., Feb. 7–9, 1949.* 41–2.

ii. Lindquist, A. W., Roth, A. R. & Yates, W. W. **Ground Pre-hatching Treatment for Mosquito Control.** *Ibid.* 42–4.

i. It has been found possible to control *Aëdes* species in areas which are covered with snow for part of the year, by the application of insecticides to the snow some weeks or months before the mosquito hatching period.

DDT, applied as an oil solution or dust from three-gallon pressure sprayers and rotary dusters, was superior to chlordane, toxaphene and gamma BHC. It was found that 0·10 lb./acre of DDT in both wettable powder form and as an emulsion gave 100 per cent. control ; a DDT dust, however, was not so effective. Applied at 0·50 lb./acre DDT, TDE and heptachlor gave similar kills, but methoxychlor was less effective and parathion ineffective.

In airplane tests, high concentrations of DDT, *e.g.*, 20 per cent. solutions in fuel oil applied at 1·1 pint/acre, were no more satisfactory than lower concentrations, *e.g.*, 5 per cent. Moreover, control was not increased by the use of six times the volume of liquid per acre.

In forested areas, dosages of 0·05 lb./acre DDT gave an 85 per cent. control, but in open tundra 0·3 lb./acre failed to control larvae. The authors suggest that this may be explained by the considerable run-off in tundra areas as the snow melts.

ii. The ground pre-hatching treatment for the control of mosquitoes has definite possibilities for the treatment of swales [marshy depressions] in mountain areas which are often impossible to treat in the spring because roads are impassable.

Complete control was obtained in swales by treatment with an oil solution and wettable powder of DDT distributed at 0·5 to 5 lb./acre. When dry deposits of DDT are used it seems likely that some of the chemical dissolves in water and gives a concentration sufficient to kill mosquito larvae. Concentrations of DDT as little as one part DDT to one or two billion parts of water will kill young mosquito larvae readily. It is possible also that some of the DDT will form a colloidal suspension.

Poor coverage of an area with insecticide gives perfect kills of mosquitoes when the insecticide is applied as a pre-hatching treatment ; this suggests that DDT goes into solution. Water samples taken from an area one year after treatment with DDT in oil solutions and a dust mixture at 0·9 to 2 lb./acre killed second and third stage *Culex* larvae in the laboratory.

C. M. Harrison

CLARKE, J. L. **Report from Illinois—DDT Fogging of Twenty-Seven Villages. Illinois State-wide Mosquito Control Activities.** *Proc. & Papers 17th Ann. Conf. California Mosquito Control Ass., Feb. 7–9, 1949.* 38–40.

During a study of the effectiveness of thermal fog generators for mosquito control made in a grass area in 1947, and in built-up, heavily wooded areas in 1948, the following points were brought out :—

1. In densely wooded areas the leaf area of the plants may be many times as great as that of the land on which they are planted ; this accounts for the low percentage recovery of DDT oil particles on slides placed on the ground.
2. Strong winds may carry particles over several miles.
3. Large particles fall close to the generator.
4. Particles of 10 microns diameter are carried upwards by up-rising air currents.

In a comparison of DDT, chlordane and pyrenone used outdoors as thermal aerosols against houseflies and mosquitoes, the amount of each insecticide used was such that the cost of each solution was the same (8 per cent. DDT, 2 per cent. chlordane and 2 per cent. pyrenone, dissolved in each case in No. 3 furnace oil). The comparative toxicity of the insecticides is given in the following table :—

	Percentage kill		
	DDT	Pyrenone	Chlordane
Flies in cages	68	37	23
Mosquito larvae in cups	5	21	14
Mosquitoes in cages	31	14	7

It was found that 400 droplets of 20 microns diameter per square inch of 5 per cent. or 8 per cent. DDT-oil aerosol were necessary to give a 95 per cent. kill of caged mosquitoes under favourable wind conditions, *i.e.*, at less than eight miles per hour.

C. M. Harrison

Busvine, J. R. & Tew, R. P. **Further Experiments with Aerosols for the Disinsectisation of Aircraft.** *Monthly Bull. Ministry of Health & Pub. Health Lab. Service (directed by Med. Res. Council).* 1950, Apr., v. 9, 80–87.

In previous experiments an aerosol based on gamma BHC and pyrethrins was an effective insecticide for use in aircraft, but the solution chosen was found to cause crazing of perspex. [See also this *Bulletin*, 1950, v. 47, 91.] Experiments were therefore carried out comparing the insecticidal effectiveness of a solution which did not cause crazing, and also of low pressure aerosol bombs, with the original solution.

Aëdes aegypti mosquitoes and houseflies in small cages were placed at different levels in a room of 2,000 cu. ft. and the knockdown and kill were determined.

The new solution had the following formula :—

gamma BHC solid concentrate	3·9 gm.
pyrethrum concentrate (6·5 per cent. pyrethrins)	77 ml.
petroleum ether (100–120°C. B.R.)	923 ml.

It was as effective when dispersed by the Porton sparklet apparatus at 20–25 ml./1,000 cu. ft. as the original solution, and had an increased rate of knockdown. When used at 10 ml./1,000 cu. ft. this solution was still very effective.

The Cooper low pressure Freon bomb, with the formula :—

gamma BHC	0·3 per cent. w/w
pyrethrins	0·2 per cent. w/w
piperonyl butoxide	1·6 per cent. w/w

was used at the rates of 3 and 15 sec. per 1,000 cu. ft. ; it gave an inferior knockdown of *Aëdes* but the same knockdown of houseflies as the other solutions.

Further experiments were carried out on the British low-pressure " Freon "-propelled aerosol bomb which had neither fire nor crazing risks. Messrs. Cooper, McDougall and Robertson made an experimental batch of bombs with two formulae :—

(1) 0.5 per cent. w/w *gamma* BHC
0·65 per cent. w/w pyrethrins
(2) 3·0 per cent. w/w DDT
0·4 per cent. w/w pyrethrins.

Both these bombs gave complete kill of *Aëdes* but the bomb containing *gamma* BHC gave a better kill of houseflies at the lower dosages than the bomb containing DDT. Both bombs gave similar knockdown when used at the same rate of pyrethrins. *C. M. Harrison*

Kettle, D. S. **An Attempt to control** *Culicoides impunctatus* **Goetghebuer in Scotland by Barrier-Spraying.** *Ann. Trop. Med. & Parasit.* 1949, Dec., v. 43, Nos. 3/4, 284–96, 2 text figs. & 4 figs. on pl. [22 refs.]

The biting midge *Culicoides impunctatus*, which is a major pest in some parts of Scotland, particularly during the months of June and July, rarely enters houses, and insecticidal treatment of the inside surfaces of the houses is useless as a control measure.

This paper is an account of experiments which were made to investigate the possibility of protecting certain sites by the residual insecticide treatment of a belt of vegetation around the site concerned. The author's summary continues : " To test this hypothesis, two areas, each consisting of 2·64 acres equally divided between woodland and open moorland, were treated with

either a DDT suspension or an emulsion at the rate of 12·1 gallons of 2 per cent. w/v technical DDT per acre (=2½ lb. technical DDT per acre). The midge population was estimated by means of 132 adhesive traps exposed at two feet, six feet and 10 feet above the ground level at 44 catching-stations, of which 20 were within the treated areas and 24 outside, to act as controls. The traps were changed weekly.

"Observations were made from May 10th until September 15th—that is, throughout the whole of the *C. impunctatus* season—and resulted in the trapping of 67,033 *Culicoides* adults, of which 65,576 (97·9 per cent.) were *C. impunctatus*. The catching-stations were so arranged that some were 20 yards and others at least 40 yards from the nearest untreated vegetation ; the control stations were at least 20 yards from any treated vegetation.

"The emulsion was applied between June 12th and 16th and the suspension between June 21st and 29th—that is, during the fifth and seventh weeks of observation. The results were most disappointing, in that there was no evidence of a reduction in the midge population in the treated areas, not even during the week of spraying. The possible reasons for this are discussed in detail, and, since laboratory tests have shown that *C. impunctatus* is readily affected by DDT deposits and that both preparations were biologically active, the failure appears in part to be attributable to unknown features in the behaviour pattern of *C. impunctatus*." [See also this *Bulletin*, 1950, v. 47, 408.]

H. S. Leeson

Freeman, P. **Notes on One African and Two Southern Palaearctic Species of *Simulium* with New Synonymy.** *Bull. Soc. Path. Exot.* 1950, v. 43, Nos. 3/4, 226–34, 9 figs.

The species concerned are *Simulium wellmanni* recorded from Transvaal, Angola, Katanga and Ruanda-Urundi ; *S. bezzi* from South Europe, Spain, France, Italy and Jugoslavia, and *S. maculatum* from Italy, Jugoslavia and South Russia (Saratov).

The paper is purely systematic and is in English with a summary in French.

H. S. Leeson

Dalmat, H. T. **Induced Oviposition of *Simulium* Flies by Exposure to CO_2.** *Pub. Health Rep.* Wash. 1950, Apr. 21, v. 65, No. 16, 545–6.

Working in the coffee plantation region of Guatemala the author attempted to establish a laboratory colony of *Simulium*. A large outdoor screen cage was constructed over a cement water channel, bordered by natural riverside plants. Wild and bred flies were introduced and permitted to feed on man and various nutritive solutions. No details are given of the number taking blood meals but none of the flies was seen to oviposit.

Some of the flies were then anaesthetized with carbon dioxide and afterwards left to recover. As a result of the treatment a few of these flies were seen to mate and the author states that a high proportion took a blood meal and some then oviposited. His overall figures show that of more than 2,500 flies treated by this method, belonging to three species of *Simulium*, 84 (3·3 per cent.) took blood meals and 32 oviposited. The eggs laid did not develop, but the author considers that the method shows promise as experimental induction of egg-laying by captive *Simulium* has not previously been reported.

M. T. Gillies

Kirk, R. & Lewis, D. J. **Three New Sandflies (*Phlebotomus*) from East Africa.** *Proc. Roy. Entom. Soc. of London.* Ser. B. 1950, Feb. 15, v. 19, Pts. 1/2, 11–13, 2 figs.

FREEMAN, P. **A Species of Chironomid from the Sudan suspected of causing Asthma.** *Proc. Roy. Entom. Soc. of London.* Ser. B. 1950, Apr. 15, v. 19, Pts. 3/4, 58–9, 1 fig.

The author received two large samples of small Chironomids, from Khartoum and Wadi Halfa, Anglo-Egyptian Sudan. Over 90 per cent. of each sample belonged to a new species, here described as *Tanytarsus lewisi*.

These insects are "suspected of causing a form of asthma among the natives". [There are reasons for supposing that the medical side of the matter has received some attention, and published information would be most welcome.]

P. A. Buxton

GHOSH, S. M. **Creeping Myiasis in Man. An Unusual Case.** *Indian Med. Gaz.* 1950, Mar., v. 85, No. 3, 96–8.

"A rare case of human myiasis due to warble fly larva is reported. A short description of myiasis producing Diptera is given. The larva recovered has been identified as the larva of *Hypoderma bovis* in its second stage of life cycle. Contact with infested cattle or resting on infested ground was probably the mode of infection. No special treatment was necessary."

MANDOUL, R., BERNARD, F. & JACQUEMIN, P. Un insecte piqueur peu connu, attaquant l'homme : *Scleroderma abdominalis* Westwood. [**A Little Known Stinging Insect which attacks Man.**] *Bull. Soc. Path. Exot.* 1950, v. 43, Nos. 3/4, 158–62, 1 fig.

The authors describe three cases of severe reaction to the sting of a small wingless wasp, *Scleroderma abdominalis* [Hymenoptera Aculeata ; fam. Bethylidae]. The adult wasp is small (2 to 5 mm. long and 0·5 mm. broad) and the amount of venom injected must be minute, but even the first attack by an insect may give rise to a marked local reaction. If the subject has been stung previously the local signs are more severe and there are also general signs ; malaise, vertigo, anorexia and mild febrile symptoms.

The wasp normally attacks the larvae of wood-boring beetles on which it lays its eggs. It is found in wooded districts or in houses where the furniture is attacked by beetle larvae.

J. H. Sudd

i. THÉODORIDÈS, J. Les coléoptères parasites accidentels de l'homme et des animaux domestiques. (Quatrième note.) [**Coleoptera as Accidental Parasites in Man and Domestic Animals.**] *Ann. Parasit. Humaine et Comparée.* 1950, v. 25, Nos. 1/2, 69–76. [19 refs.]

ii. HARANT, H. & THÉODORIDÈS, J. Note sur les cas d'infestation accidentelle par des coléoptères chez l'homme. [**Record of Observed Cases of Accidental Infestation of Man by Coleoptera.**] *Bull. Soc. Path. Exot.* 1950, v. 43, Nos. 1/2, 54–6.

i. The first paper contains more records (collected from the literature) of accidental infestations of man by the larvae and adults of beetles (*Coleoptera*). The term "cantharias", it is proposed, should be restricted to the infestation of the digestive organs of man by the larvae of beetles and "scarabiasis" used for infestation by adult beetles.

ii. The second paper lists the numbers of cases of accidental infestation so far recorded : they are shown in terms of families of the *Coleoptera* and the stage of the beetles. Adult beetles found infesting man belong to six families

and the most numerous records concern members of the *Scarabaeidae*. Larval beetles occur in nine families, one of which was not determined : most cases were due to *Tenebrionidae* (meal worms). The other families listed provide one or two examples only. [See also this *Bulletin*, 1949, v. 46, 1089.]

H. S. Leeson

Théodoridès, J. Considérations sur les *Paederus* vésicants (*Coleoptera staphylinidae*) et assais de vésication avec des espèces de France. [**Notes on Vesicant *Paederus* (*Coleoptera*) and Experiments in Vesication with Species met with in France.**] *Bull. Soc. Path. Exot.* 1950, v. 43, Nos. 1/2, 100–113, 4 figs. on 2 pls. [32 refs.]

Gil Collado, J. Acaros Ixodoideos de España. [**The Ixodidae of Spain.**] *Rev. Sanidad e Hig. Pública.* Madrid. 1948, May, v. 22, No. 5, 389–440, 68 figs.

Brown, J. H. & Kohls, G. M. **The Ticks of Alberta with special reference to Distribution.** *Canadian J. Res.* Sect. D. Zool. Sci. 1950, June, v. 28, No. 3, 197–205, 5 figs. [16 refs.]

de Bustamante, F. M. & Pires, W. da M. Sôbre um novo dispositivo prático para avaliação da toxicidade de superfícies tratadas com inseticidas de ação residual. [**A New Method for evaluating the Toxicity of Surfaces treated with Residual Insecticides.**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1950, Jan. 15, v. 2, No. 1, 5–22, 8 text figs. & 9 figs. on 6 pls. English summary.

The English summary appended to the paper is as follows :—

" 1. The authors present the results of biologic tests for the appraisal of DDT's toxicity, when applied to walls, by means of a new apparatus developed by the National Malaria Service.

" 2. For those experiments were used *anophelines* and *culicines*, specially the first, captured with Shannon ' dawn traps '.

" 3. Mosquitoes were exposed during 30 minutes to treated surfaces and mortality was observed at the end of 2, 6 and 24 hours, as a routine.

" 4. It was assumed that less than 60 per cent. 24 hours mortality due to DDT, is an index of unsatisfactory toxicity of the surface in test, requiring a new treatment."

Messerlin, A. & Mechali, D. Note sur la durée de l'activité remanente du D.D.T. et de l'H.C.H. [**Duration of Residual Activity of DDT and Benzene Hexachloride.**] *Bull. Inst. Hyg. Maroc.* 1949, v. 9, Nos. 1/2, 135–7, 1 chart.

The following method was used to compare the residual powers of 10 per cent. DDT powder and 3 per cent. BHC [probably about 0·3 per cent. gamma BHC]. Small pieces of cloth were dusted on both sides with 0·1 gm. of the powders and put into crystallizing dishes. At different intervals up to four months, a pair of dishes was taken and 20 body lice were placed into each. The mortality was observed after 30 hours (at which time controls were beginning to die).

The DDT powder caused 90 to 100 per cent. kill of lice at first and its efficiency fell off only slowly to 60 per cent. after four months. The BHC caused a similar kill at first, but fell off steeply in the first month to about 40 per cent. kill, and then more slowly to a negligible kill after 90 to 100 days.

J. R. Busvine

MESSERLIN, A. & MECHALI, D. Note sur les voies de pénétration du D.D.T. et de l'H.C.H. dans l'organisme des insectes. [**The Routes of Penetration of Insects by DDT and Benzene Hexachloride.**] *Bull. Inst. Hyg. Maroc.* 1949, v. 9, Nos. 1/2, 131–3.

The authors describe experiments to show the remote effects of certain insecticides on lice. DDT powder (10 per cent.) applied to the surface of body lice caused 100 per cent. mortality in 22 hours, while 32 per cent. died when confined in close proximity to, but not in contact with, the same powder. Sixty per cent. of lice coming in contact with 3 per cent. *gamma* BHC died in the same period, but on the other hand 80 per cent. died when they were confined in proximity to the powder in a closed bell jar. Twenty lice were used in each experiment and mortality among controls was 3 per cent. The authors consider that these results are in agreement with those of DE MEILLON [this *Bulletin*, 1947, v. 44, 469] and others in suggesting that other means of penetration of these insecticides than through the integument may be important, more particularly with *gamma* BHC. *M. T. Gillies*

PILLE, G. Essai titrimétrique des solutions de D.D.T. dans le pétrole. Pourcentage en D.D.T. total et en isomère actif pp′. [**Estimation of DDT in Kerosene in Terms of Total DDT and Active** pp′ **Isomer.**] *Méd. Trop.* Marseilles. 1950, Jan.–Feb., v. 10, No. 1, 73–84, 2 figs.

This paper details a reliable argentimetric dehydrochlorination method of DDT estimation.

REPORTS, SURVEYS AND MISCELLANEOUS PAPERS

J. NATIONAL MALARIA SOC. 1950, Mar., v. 9, No. 1, 99–102. **The Liberian Institute takes Shape.**

Between 1941 and 1945 the American Foundation for Tropical Medicine in co-operation with Harvard Medical School carried out researches on trypanosomiasis in Liberia. The work resulted in the promise of an endowment from the Firestone Plantations Company for a permanent research institute in that country, for the establishment and management of which the Foundation accepted responsibility. The first construction has now been started. A working agreement has been made with the Liberian Government which provides land with room for future expansion, and a complete freedom of access to material and of import of scientific equipment. The Institute is to be managed by a Board which aims at making it an international centre for research, the programme of which will be screened by a Scientific Advisory Committee made up of representatives from a number of American medical schools, government departments and commercial organizations. In addition a number of leading foreign schools will be asked to name representatives to advise on research in other places. It is hoped to make the Institute available to foreign workers in exchange for facilities granted in research institutes elsewhere.

G. Macdonald

GITHENS, T. S. **Drug Plants of Africa.** *African Handbooks : 8.* pp. vii+125. 1949. Philadelphia : University of Pennsylvania Press, The University Museum.

CORRESPONDENCE

MAC ARTHUR, W. P. **The Identification of some Pestilences recorded in the Irish Annals.** Reprinted from *Irish Historical Studies.* 1949, Mar., v. 6, No. 23, 169–88. [Refs. in footnotes.]

With reference to the abstract of the above paper [this *Bulletin*, 1950, v. 47, 419] the following letter has been received from the author :—

Sir, my paper on the pestilences of ancient Ireland states that in Donegal, anthrax in animals is known by the Gaelic term *cos dhubh*, which means black leg. In your review (this *Bulletin*, v. 47, 420) your reviewer comments : " In other countries, and perhaps in other parts of Ireland, ' black leg ' is a synonym of Black quarter . . . which is caused by *Clostridium chauvoei* and has nothing to do with anthrax."

Although my statement is not questioned, it might be well to explain that at one time I assumed that *cos dhubh* probably stood for black quarter, but on asking for some particulars of *cos dhubh* from those familiar with it, I was told that this disease is very infectious to man ; that cattle dead of it must be buried in quicklime to prevent infection of grazing land, and if the carcase is handled in the process, severe and dangerous sores may be contracted. Clearly this is anthrax, and not black quarter.

The reason for using *cos dhubh* for severe scurvy in man is clear from contemporary medical reports of the famine of 1846–49, in which victims of the disease are described as having the legs completely black up to the middle of the thigh.

The point of my argument, however, was to show that the same term may indicate one disease if applied to animals, and a different disease if applied to man.

I am, etc.,

(Sd.) *W. P. Mac Arthur*

BOOK REVIEWS

BRAZZAVILLE. **Conférence africaine sur la tsé-tsé et la trypanosomiase, Brazzaville 2-8 février 1948.** [African Conference on Tsetse and Trypanosomiasis, Brazzaville, 1948.] Edité par la " Documentation Francaise ". 441 pp., 3 figs. 1950. Toulouse : Imprimerie Régionale, 59 rue Bayard.

The Conference was attended by delegates from : France, the French colonies of West Africa, Equatorial Africa, and the Cameroons ; the Belgian Congo ; the Portuguese territories of Mozambique, Angola and Portuguese Guinea ; the Union of South Africa ; Northern Rhodesia, Southern Rhodesia and Nyasaland ; the Sudan ; Britain ; and the British West and East African colonies. Dr. E. A. H. Friedheim of New York, U.S.A., was also present and took part in the discussions on recent trypanocidal drugs.

Three committees were formed : a directing or Steering Committee ; a committee to deal with the use of drugs, resettlement of populations, and the choice of symbols for mapping the incidence of *Trypanosoma gambiense* ; and a committee to consider entomological control and insecticides, agronomic prophylaxis, the game reservoir question, and the choice of symbols for mapping the distribution of tsetse flies.

The first 93 pages of the volume include short accounts, with discussions, by the delegates of the work done in the various territories together with the decisions and recommendations of the committees, while the remaining 348 pages form a supplement containing 53 scientific papers by about 30 authors. These are mainly detailed reports of work done and results obtained and together they form a most useful and interesting all-round review of the subject by experts on its various aspects.

Conclusions and recommendations.—For better co-ordination of research the Conference recommended that an International Scientific Committee of experts be formed and that the Tsetse-Fly and Trypanosomiasis Committee of the Colonial Office in London be invited to begin the necessary arrangements ; a Bureau for the distribution of information should be established at Brazzaville and Léopoldville.

Drugs.—It was agreed that the second (nervous) stage of sleeping sickness is reached when the cerebrospinal fluid has more than three cells per cmm. and more than 0·025 mgm. per 100 ml. of total protein. Discussion was chiefly limited to the newer trypanocidal drugs. Pentamidine isethionate or methanesulphonate (Lomidine) is the best drug for the first stage of Gambian sleeping sickness but is ineffective in an advanced second stage of the disease ; the intramuscular route is strongly recommended in the conditions of field work. Of the new arsenicals, melarsen oxide and " Mel-B ", a combination of melarsen with BAL (British anti-lewisite) are highly esteemed by French workers, " butarsen " (70A) less so, but all these are effective in tryparsamide-resistant strains of *T. gambiense*. The new antimonials " MSb " and " MSb-B " (MSb combined with BAL) have given encouraging results but are regarded as still on trial. The Committee recommended that some of the new drugs should be tried in Rhodesian sleeping sickness. Both moranyl (germanin, antrypol etc.) and pentamidine have a good prophylactic effect, the latter being preferable. Dr. Lourie found that " MSb " had a longer protective effect in mice than moranyl or pentamidine and it is being tried in field experiments on sleeping sickness.

In animal trypanosomiasis, Dimidium bromide (1553, a phenanthridinium compound) is the best drug for *T. congolense* infection ; further investigation of compounds of " Surfen C " should be made.

The Committee defined indices of new infections and of total infections ; the former is the proportion of new cases to the number of persons examined less the old cases, while the latter is the proportion of total cases to the number of persons examined. With regard to the resettlement of populations they decided that it is not required in Gambian sleeping sickness until all other measures have failed, but recommended it for Rhodesian sleeping sickness areas on the basis of Dr. Fairbairn's experience, and stated that game round the settlements should be controlled.

Entomological control.—The numerous well-known anti-tsetse measures—catching and trapping, parasites, insecticides, clearing of vegetation, grass fires and fire exclusion, barrier clearings, and game control—are mentioned and considered separately in relation to different species of tsetse fly. Total, discriminative, or selective clearing is recommended for *G. palpalis* and *G. tachinoides* in savanna regions and should be followed by agricultural development ; the use of attractant screens in isolated blocks of vegetation has succeeded in East Africa. For *G. morsitans* and *G. swynnertoni* they advise discriminative clearing with and without fire exclusion where the fly-infested areas are well-defined and not very extensive. Other methods are still of doubtful value. For *G. pallidipes* intensive partial clearing (Tanganyika Territory, Zululand), late grass fires and game control (Uganda), DDT smokes from aircraft and ground generators (Zululand) have been successful ; traps have failed.

Total clearing (Belgian Congo) for *G. fusca*, and partial clearing (Kenya and Tanganyika territory) for *G. brevipalpis* and *G. austeni* have also succeeded. The use of insecticides is so promising that it should be placed on an international basis.

Destruction of game has been shown to be effective against *G. morsitans*, especially in Southern Rhodesia ; it need not be considered for the *palpalis* group. This question was well discussed at one of the sessions and is dealt with in a paper by Professor Buxton which is included in the supplement.

Symbols for cartography.—Three maps of the distribution of tsetse flies will be prepared for eastern, central and western Africa respectively on the scale of 1 : 300,000 and a general map for Africa on the scale of 1 : 8,000,000. Different colours will indicate different tsetse flies, black stippling will show tsetse-free areas, and doubtful areas will be shown by the letters gg gg gg dispersed over the areas. Symbols (diamonds, triangles, circles, squares) will represent groups and species. Fly-boys and various traps should be used for detection of flies. *J. F. Corson*

PINTO, Cesar & DE ALMEIDA, Antonio Firmato. **Schistosomiasis mansoni no Brasil. (Doença dos caramujos ou chistosa.)** [Schistosomiasis mansoni in Brazil.] *Monografias Inst. Oswaldo Cruz.* Rio de Janeiro. 1948. Jan. No. 5, 287 pp., 20 coloured pls., 91 figs. & 3 graphs.

In a brief introduction the authors indicate how serious and widespread is infestation by *Schistosoma mansoni* in Brazil ; they mention that faecal examination has revealed 35 per cent. in Alagôas, 33 per cent. in Pernambuco, 32·5 in Sergipe and 29 in Bahia.

The book itself comprises 13 chapters from which it will be seen that the subject is comprehensively dealt with. The first chapter is historical and forms an interesting outline of the progress of knowledge on this disease since Sir Armand Ruffer found the ova in mummies dating back to 4000–3000 BC. Then down the ages with the special landmarks of Bilharz (1853) who discovered the ova, of Cobbold (1864) and the evolution in molluscs, Allen (1888) and the transmission of infection by water, Manson (1903) and the suggestion of two species with ova having lateral and terminal spines, and found in rectum and bladder respectively ; Letulle (1904) who found the infection in Martinique and studied the pathological anatomy in the intestine and liver ; Katsurada of Japan who discovered a third species infecting man, *S. japonicum* ; Sambon's studies in 1907 and 1909 ; Piraja da Silva and his work on schistosomiasis in Brazil ; Macdonagh (1915) and Christopherson (1918) and the therapeutic action of tartar emetic ; Leiper (1915) and the evolutionary cycle in freshwater snails (*Planorbis*) ; Lutz (1917 and 1919) and the evolution in *Australorbis olivaceus* in Brazil and the transmission of infection to guineapigs and rabbits ; Lutz and Penna (1918) and their epidemiological studies in Northern Brazil ; Hamilton Fairley (1919) and fixation of complement for diagnosis, and Fairley and Williams and the intradermo-reaction with cercariae ; T. W. M. Cameron who found the ova in the faeces of *Cercopithecus sabaeus*, African monkeys in St. Kitts, and, lastly, Pinto (1944) and the infection of armadillos.

Chapter II contains a description of the worm and its developmental stages from ovum to miracidium and cercaria to the adult. This is followed by an account of its evolution in Planorbidae and experiments to test the survival of cercariae in water. This chapter also contains a key to the identification of cercariae in Brazilian molluscs. Chapter IV details the manner of penetrating the body of the receptive mammal and the time taken ; the stages are illustrated by a series of photomicrographs. The next two chapters are of importance from the pathological aspect. The first treats of comparative pathology, the

technique for infecting rats, rabbits, monkeys and armadillos, in the last of which at least the lesions resemble those seen in human infestation. The lesions in the different organs are described and illustrated. Experimental infestation of domestic animals was successful in dogs and the capybara, but not in pigs and deer. The second of these two chapters deals with the pathological anatomy and histology in man, the changes in liver, spleen, intestines, pancreas, lungs, myocardium, the genitalia and the blood, with good photomicrographs. Chapter VII treats of diagnosis by means of faecal examination and biological reactions with antigens prepared from adult worms, from cercariae, and from *Eurytrema coelomaticum*, and fixation of complement with cercarial antigen. [This subject of diagnosis is dealt with very fully by Professor Vianna MARTINS in his book (see this *Bulletin*, 1950, v. 47, 760) and together with the present work we have a most complete account of schistosomiasis mansoni in Brazil in all its aspects.] Chapter VIII is of the utmost importance for the general practitioner, for it is concerned in detail with the clinical forms of the disease. " The interval between the moment of penetration of cercariae and the appearance of ova in the faeces ", called the incubation period because the passing of ova generally coincides with the first symptom, is variously estimated at five weeks (PIFANO and MAYER), six weeks (FAUST, JONES, and HOFFMAN) and 55 days (Vianna MARTINS), and the most prominent symptoms are diarrhoea and tenesmus and the stools may or may not contain (visible) blood, enlargement of liver and spleen, abdominal pain, usually fairly general, nausea, vomiting and loss of weight. The infestation rate is highest in the 15–30-years age-group. It ranks second among the helminthic infestations in northern Minas Gerais ; ascariasis accounts for 41·1 per cent., schistosomiasis for 28·7, *Necator americanus* for 18, *Strongyloides stercoralis* for 13·7, *Trichuris* 6·7, *Taenia* and *Hymenolepis* just over one, and *Enterobius* for only 0·26 per cent. The clinical forms are divided into intestinal, hepatic, splenic and pulmonary, but some patients present ill-defined nervous symptoms—dyspnoea, epileptiform crises, convulsions and delirium—but if ova invade the spine a myelitis may be set up with paralysis. Photomicrographs illustrate a granuloma in the spinal cord and a coloured plate depicts one around ten ova, eight of which contain miracidia. Death may result from haematemesis, hepatic cirrhosis, hyperparasitaemia, stricture of the bowel and intestinal obstruction, or adenocarcinoma of the rectum. Chapter IX is concerned with epidemiology. In fields of watercress cultivation (*Nasturtium officinale*) fertilized with human excreta ova of *S. mansoni* abound and *Australorbis olivaceus* proliferates. Also, many ponds and water collections are fed by streams where the snail is abundant and the cercarial index very high. Thus, in Itambacuri municipality, out of 220 specimens of *A. olivaceus* dissected, 148 (67 per cent.) were infested with the cercariae. A second study a month later gave 584 positive out of 720 examined (81 per cent. positive). Again, in one quarter of Teófilo Otoni municipality the percentage was 85. The geographical distribution and density (*freqüência*) of *S. mansoni* in Brazil are given in tables showing the numbers of livers examined by viscerotomy, the numbers found positive and the percentages for the municipalities in the different States. A chapter on prophylaxis records the lethal effects on the mollusc of Brazilian plant saponins—*Serjania* whose bark contains 14 per cent. of saponins ; *Sapindus saponaria* 12–18 per cent. ; *Fourcroya* species are toxic and very fatal to *Australorbis olivaceus*. Other prophylactic measures suggested or in force are on the usual lines of prevention of water pollution by human excreta, construction of adequate latrines, prohibition of bathing and washing of clothes in infested waters, destruction of the vector mollusc, wearing of long boots by those engaged in railroad construction who have to work in contaminated water, education, propaganda, films, pamphlets, talks, etc.

The chapter on treatment is contributed by Dr. Heraldo Maciel who mentions a number of drugs, notably tartar emetic (with a history of its use and the results reported by various investigators), antimony sodium tartrate, antimosan, fouadin, stibenyl, stibosan and neostibosan and emetine. A final chapter is concerned with molluscan transmitters, the technique of dissection of them, the characters and situation of the parasite in the snail and its development. Thirty-nine species of these molluscs are stated as being found in S. America.

Appended to the volume are beautifully reproduced coloured plates depicting the worms, the ova drawn to scale to compare with *Necator*, *Trichuris* and *Ascaris*, the miracidium, stained sections of the vector, of the liver of an infected armadillo, granulomata of liver and intestine, rectal polyp due to this schistosome, the wall of the bowel showing the parasites in the veins, lung with ovum containing a miracidium and the spinal granuloma referred to already.

There is a good index. To sum up : the work is very comprehensive and no higher praise can be given to it than to say that it is a monograph worthy of the Oswaldo Cruz Institute which has produced it. *H. Harold Scott*

GELFAND, Michael [M.D., M.R.C.P.]. **Schistosomiasis in South Central Africa. A Clinico-Pathological Study.** 239 pp., 23 figs. & 5 pls. (1 map). 1950. Cape Town, P.O. Box 30 & Johannesburg, P.O. Box 1010, Juta & Co. Ltd. [25*s*.] [Copies obtainable from H. K. Lewis & Co. Ltd., London.]

Dr. Gelfand has made numerous contributions to the literature on schistosomiasis during recent years, and these have been summarized in this *Bulletin* from time to time. The present volume comprises a study, collected into book form, of his observations on the disease as a result of his personal experience of it since his arrival in Southern Rhodesia in 1939. With the facilities afforded him as a clinician at the Native Hospital, Salisbury, and also as radiologist, pathologist and morbid anatomist to the hospital, and with access to the Public Health Laboratory, he has enjoyed an almost unique range of material deriving from a wide area in South Central Africa ; of this he has made very full use.

The incidence of schistosomiasis, due both to *Schistosoma haematobium* and to *S. mansoni* he has found to be very high in the African populations examined in S. Rhodesia. The persons studied were drawn from a wide area of South Central Africa including not only Southern Rhodesia, but Nyasaland, Portuguese E. Africa, and Northern Rhodesia, as well as other territories to a minor degree. The high incidence of the infections was not revealed by the usual clinical laboratory investigations, which yielded an infection rate of only 16·5 per cent. in 2,260 of those examined ; routine autopsy of all patients dying in hospital, or as a result of misadventure, showed that 82 per cent., of 200 examined harboured one or other, or both, parasites. Schistosomal infections were rare in children under three years of age, only 10 per cent. of 50 children under three being found at autopsy to harbour them ; this is attributable to restraint from bathing in rivers for fear of drowning or crocodiles, and to the destruction of the cercariae in infective transported water by mechanical agitation and by storage.

In adults it was found that though on clinical examination *S. mansoni* infestation appeared to be the more prevalent, at autopsy, with the use of a digestion technique, *S. haematobium* infestations were much the more numerous ; 144 of 200 patients at autopsy were shown to harbour the latter parasite while only 60 of these had an *S. mansoni* infection. In half the patients suffering from *S. haematobium* infestations there were no symptoms referable to the

urinary system. Snippings from the bladder wall, preferably from the fundus, usually yielded ova even when the bladder appeared normal.

Among other matters of interest, and in some cases in opposition to current views, emerge the following points. In the majority of cases of *S. haematobium* infection the urine was acid and stone in the bladder was rare, probably on account of the acidity of the urine ; urinary calculus is also a rarity in the African. Calcification of the bladder is radiologically demonstrable in about 17 per cent. of adult Africans passing *S. haematobium* ova in the urine ; this calcification may be partial or it may be apparent in the whole bladder outline ; occasionally it is associated with calcification of the ureter, confined usually to its lowermost portion. About a third of the Africans suffering from vesical schistosomiasis at autopsy were found to have gross lesions in the ureters, and these usually took the form of dilatation ; stenosis of the ureters or their orifices was but rarely seen. The dilatation was due to actual lesions in the ureteral wall, and it was not secondary to stricture. Malignant changes in patients suffering from urinary schistosomiasis were no more commonly encountered than in inhabitants of non-schistosomal areas.

In *S. mansoni* infections three-quarters of the patients had not complained of any symptoms referable to the infection ; of the observed symptoms diarrhoea was the most important, but bilharzial dysentery was uncommon. In more than half the cases of *S. mansoni* infestation sigmoidoscopy showed no obvious change in the mucosa, thus simple sigmoidoscopy proved of little value in the diagnosis of the condition. Rectal snippings through the instrument, however, proved of much value in detecting an infection with *S. mansoni* and also in disclosing an *S. haematobium* infection in the bowel ; in some cases where *S. haematobium* eggs were not found in the urine or in the stools bowel snippings revealed their presence. No case of malignant disease of the large bowel was found in association with a schistosomal infection.

Although the vermiform appendix was commonly found on section to contain eggs of *S. haematobium*, or of *S. mansoni*, appendicitis is very much less common in the African than in the European, in spite of the much higher instance of schistosomiasis in the former ; bilharzial infection of the appendix therefore rarely causes symptoms.

Ova of *S. haematobium* and of *S. mansoni* are not uncommonly found in the lungs at autopsy ; of 108 cases (75 suffering from an *S. haematobium* infection, nine from an *S. mansoni* infection, and 24 from a mixed infection) ova were recovered from the lungs in 64 ; 60 of these were *S. haematobium* ova, and four were ova of both parasites. Ova were also recovered from the livers in 50 of these 64 patients. There is no evidence that patients with ova in the lungs were prone to contract lung diseases and no case of Ayerza's syndrome attributable to schistosomiasis was encountered ; no specific radiological changes in the lungs ascribable to the infection were observed. Although inflammatory lesions and tubercles may be found in the liver lobules or the periportal tissues the author is of the opinion that schistosomiasis cannot be considered a cause of cirrhosis of the liver, or of splenomegaly. These lesions are localized and are merely incidental to any other specific pathology in the liver such as cirrhosis, and not causative of it. Schistosome ova have been found in the spleen on occasions, but considerably less frequently than in the liver. The incidence of primary hepatic cancer was no greater than that found elsewhere in Asia, Africa or South America. Only four of the 13 cases of this condition seen had bilharzial infections, and the author does not consider that the schistosomal infection in any of them was either a direct or indirect factor in the causation of the malignancy.

Other organs, including the pancreas and the gall bladder, were found on occasions to contain eggs, but these were not responsible for any specific

pathology ; diabetes mellitus, chronic cholecystitis, or gall stone formation had no particular association with the infestation. Eggs of *S. haematobium* have been recovered from various parts of the central nervous system and spinal cord ; a case of bilharzial myelitis with a spastic paraplegia is described. It was thought possible in some cases that epilepsy, nerve pains or alterations in mentality might have been attributable to the scattered deposition of ova in appropriate parts of the brain.

In African women, *S. haematobium* infection commonly involved the genitalia, but *S. mansoni* did so much less frequently ; if an African woman has schistosomiasis the appropriate eggs can usually be found in some portions of the genital tract on autopsy. Where local deposition of the ova is considerable, particularly in the Fallopian tubes or in the ovaries, various gynaecological sequelae may be expected.

In diagnosis the skin test with a cercarial antigen proved of limited value, and it afforded information as a " pointer " rather than as a diagnostic aid ; eosinophilia was very variable, and a normal eosinophil count does not exclude a diagnosis of schistosomiasis.

In conclusion, a study of this work leaves the reader with much to think about, and with an impression that schistosomiasis is not so grave a disease in causing either morbidity or mortality as is currently taught. The volume is one that merits the careful attention of workers both in the field and in the laboratory, and is a serious and substantial contribution to knowledge of its subject matter.

The facts and the conclusions to be drawn from them are lucidly stated and clearly set out in this volume ; the book is well printed and bound, and it is singularly free from printer's errors. The author is to be congratulated on his enlightening and instructive labour. *A. R. D. Adams*

FINDLAY, G. M. [C.B.E., Sc.D., M.D., F.R.C.P.]. **Recent Advances in Chemotherapy. Vol. I.** 3rd Edition, pp. ix+625. 1950. London : J. & A. Churchill Ltd., 104, Gloucester Place, W.1. [36*s*.]

Many people are troubled from time to time by the kind of dream in which something is running away and one tries desperately and hopelessly to catch it up, while it plunges on at ten times the speed of one's own leaden feet. Dr. Findlay probably does not experience such dreams. The progress of chemotherapy since 1930, when the 1st Edition of his *Recent Advances in Chemotherapy* appeared, has been prodigious, but the same could justly be said of the way in which he has kept abreast of that progress.

The 1st Edition was a single volume of 532 pages, while the 3rd Edition is to occupy four volumes, the first of which is now available and is here reviewed. It covers 625 pages, and deals with insect and helminthic infestations, amoebiasis, leishmaniasis, trypanosomiasis, babesiasis and miscellaneous other protozoal or related infections such as bartonellosis and toxoplasmosis. There are also interesting and entertaining sections on the history of chemotherapy. We are told, for example, that Rhazes (about 900 A.D.), like other Arabian physicians of the time, was wont to test out drugs on animals and was familiar with the toxic effects of mercury from his experiments on monkeys. Chauvinists will be glad to hear that it was Gilbert the Englishman, about the year 1200, who was the first to prepare mercurial ointment. But pioneer work on chemotherapeutic aerosols is said to go back even further, to the Angel Raphael, on whose advice, according to the Book of Tobit, Tobias " took the ashes of the perfumes, and put the heart and the liver of the fish thereupon and made a smoke therewith " in order to disembarrass his bride Sara of the evil spirit with which she happened to be infected.

There must be few recent advances which have escaped the author's notice. Undoubtedly, those specially interested in a particular field will find occasional omissions : for example, no mention is made of Holton's method for the assay of anti-cestode compounds [this *Bulletin*, 1947, v. 44, 835]. But there is a rich profusion of references to published work, supported by many long extracts or abstracts of the detail contained in the original papers, including innumerable very useful tables. Such liberality will be invaluable to workers in remote places where library facilities are poor, while those with a good library at hand will now have less reason than ever to complain that they do not know which papers to look up.

From the fact that 20 vital years in chemotherapy have elapsed, it will be understood that this book is unrecognizable as a successor to its 1st Edition. There are also changes and improvements in the book unrelated to the fact that the subject has taken such great strides forward. Specially worth mentioning is that the reader can now accept its chemical nomenclature and chemical formulae with complete confidence.

Most people using the book will think of alternative arrangements of the material, or alternative chapter- and section-headings which might suit them better, but this could be said of almost any book. Such a defect is of little consequence in a volume which no one would attempt to read as a continuous story from cover to cover, for it has an excellent subject- and author-index, which ensures that the reader will have no difficulty in finding what he is looking for.

The author is to be congratulated on a remarkably comprehensive volume. It can be recommended without hesitation as a source book which no one interested in chemotherapy can afford to neglect. *E. M. Lourie*

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